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FM 5-132

DEPARTMENT OF THE ARMY FIELD MANUAL

ENGINEER COMBAT BATTALION DIVISIONAL

DEPARTMENT OF THE ARMY • JANUARY 1952


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FM 5-132

ENGINEER
COMBAT BATTALION
DIVISIONAL
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CONTENTS

CHAPTER 1. INTRODUCTION:	<i>Paragraphs</i>	<i>Page</i>
<i>Section I.</i> General.....	1-3	1
<i>II.</i> Organization.....	4-8	3
CHAPTER 2. ENGINEER COMBAT COMPANY:		
<i>Section I.</i> General.....	9-11	14
<i>II.</i> Squad.....	12-13	16
<i>III.</i> Duties of squad personnel..	14-18	17
<i>IV.</i> Squad employment and pio- neering operations.....	19-20	20
<i>V.</i> Engineer squad combat operations.....	21-26	23
<i>VI.</i> Squad training.....	27-29	27
<i>VII.</i> Platoon.....	30-31	28
<i>VIII.</i> Duties of platoon head- quarters personnel.....	32-36	29
<i>IX.</i> Platoon employment and pioneering operations.....	37-38	32
<i>X.</i> Engineer platoon combat operations.....	39-44	35
<i>XI.</i> Platoon training.....	45-46	43
<i>XII.</i> Company headquarters.....	47-48	44
<i>XIII.</i> Command echelon.....	49-51	44
<i>XIV.</i> Administrative echelon....	52-57	50
<i>XV.</i> Company employment and pioneering operations....	58-59	58
<i>XVI.</i> Company combat opera- tions.....	60-65	61
<i>XVII.</i> Company training.....	66-67	71

CHAPTER 3. HEADQUARTERS AND SERVICE COMPANY:

	<i>Paragraphs</i>	<i>Page</i>
<i>Section I.</i> General.....	68-72	73
<i>II.</i> Assault platoon.....	73-78	76
<i>III.</i> Assault platoon combat operations.....	79-85	80
<i>IV.</i> Bridge platoon.....	86-87	84
<i>V.</i> Fixed sections.....	88-91	86
<i>VI.</i> Float section.....	92-95	90
<i>VII.</i> Platoon headquarters.....	96-98	92
<i>VIII.</i> Platoon operations and training.....	99-101	93
<i>IX.</i> Equipment and maintenance platoon.....	102-107	95
<i>X.</i> Company headquarters....	108-109	104
<i>XI.</i> Command echelon.....	110-111	104
<i>XII.</i> Administrative echelon....	112-116	107
<i>XIII.</i> Company operations and training.....	117-118	110

CHAPTER 4. BATTALION HEADQUAR- TERS:

<i>Section I.</i> General.....	119-120	112
<i>II.</i> Command section.....	121-122	113
<i>III.</i> Division engineer section...	123-125	117
<i>IV.</i> Administrative section.....	126-128	118
<i>V.</i> Intelligence section.....	129-131	122
<i>VI.</i> Operations section.....	132-134	128
<i>VII.</i> Supply section.....	135-139	132
<i>VIII.</i> Communication section....	140-143	141
<i>IX.</i> Reconnaissance section....	144-147	145
<i>X.</i> Battalion maintenance sec- tion.....	148-151	150
<i>XI.</i> CHAPLAIN SECTION....	152-153	155
<i>XII.</i> Medical detachment.....	154-157	156

CHAPTER 5. BATTALION OPERATIONS:

<i>Section I.</i> General.....	158-160	159
<i>II.</i> Training.....	161-171	160
<i>III.</i> Administrative movements..	172-178	172
<i>IV.</i> Tactical movements.....	179-181	179

CHAPTER 5. BATTALION OPERATIONS—Continued

	<i>Paragraph</i>	<i>Page</i>
<i>Section V.</i> The advance and attack.....	182-193	182
VI. Pursuit.....	194-197	196
VII. The defense.....	198-203	198
VIII. Radiological defense.....	204-209	211
IX. Defense against guerilla forces.....	210-216	216
X. Retrograde movements.....	217-222	220
XI. Denial operations.....	223-227	225
XII. River-crossing operations..	228-240	228
XIII. Standard river-crossing equipage.....	241-250	240
XIV. Tactical procedure.....	251-259	262
XV. Engineer plan.....	260-261	280
XVI. Infantry combat.....	262-264	294
XVII. Special operations.....	265-270	300
APPENDIX I. REFERENCE.....		315
II. TYPICAL SOP.....		323
III. TYPICAL REORGANIZATION OF ENGINEER COMBAT BATTALION, DIVISIONAL, FOR COMBAT AS INFANTRY.....		335
IV. A GUIDE FOR DUAL-ROLE PROBLEMS.....		339

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. PURPOSE

The purpose of this manual is to provide information and guidance for individual and unit training of the engineer combat battalion, divisional.

2. SCOPE

This manual outlines the organization, employment, missions, equipment, training, and capabilities of the engineer combat battalion, divisional. Although the combat principles described herein are established doctrine, detailed items, such as equipment and specific duties of personnel, are subject to frequent changes. The user should consult the latest applicable T/O&E for such changes before using this manual. Because of the possible changes in equipment, model numbers have been omitted except in appropriate charts. This manual is based on T/O&E 5-15N, 3 May 1948; T/O&E 5-16N, 3 May 1948; and T/O&E 5-17N, 4 February 1948, all as amended to 1 June 1951.

3. MISSION

The mission (fig. 1) of the engineer combat battalion, divisional, is to increase the combat effective-

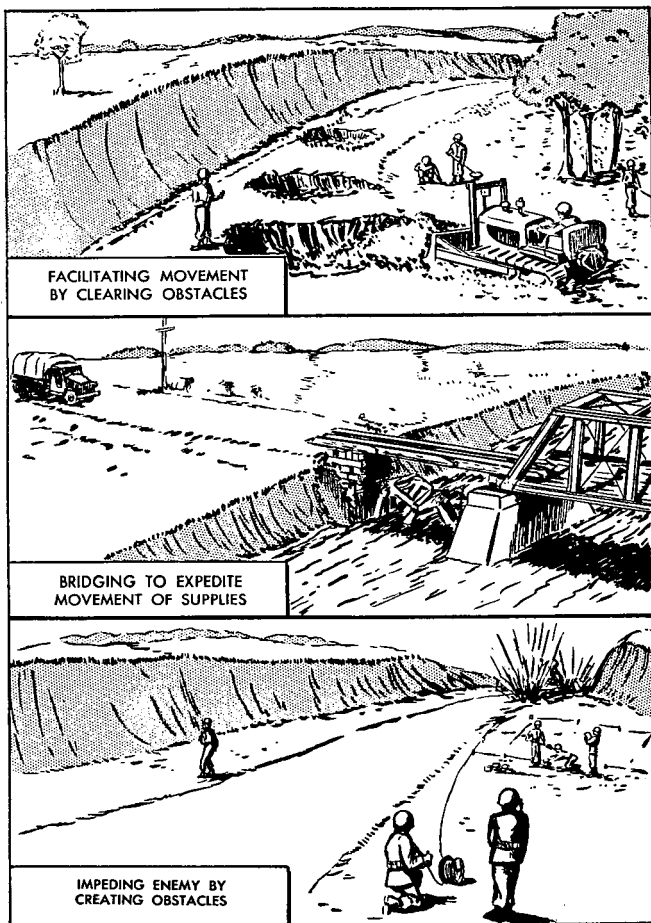


Figure 1. Typical tasks of the engineer combat battalion, divisional.

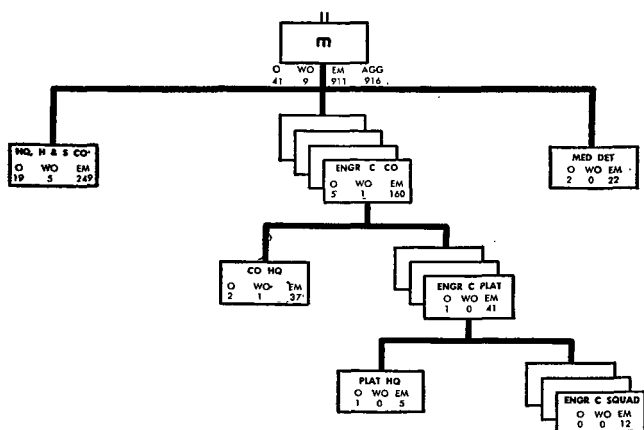
ness of the infantry division by means of general engineer work.

Section II. ORGANIZATION

4. COMPOSITION

The engineer combat battalion, divisional, has a battalion headquarters, a headquarters and service company, four identical combat companies, and a medical detachment (fig. 2).

ENGINEER COMBAT BATTALION DIVISIONAL



ENGR C BN INF DIV T/O&E 5-TSN 3 MAY 1948 AS AMENDED

Figure 2: Organization, engineer combat battalion, divisional.

5. MAJOR ITEMS OF EQUIPMENT

The engineer combat battalion, divisional, is completely mobile in organic transportation and is well-provided with general engineer equipment (table I).

Table I. Major Items of Equipment, Engineer Combat Battalion, Divisional

	C-119B	C-124A	Unit	Battalion	Headquarters and headquarters and service company							Combat company				Med det	
					Total	Bn hq	Co hq	As-sault plat	Bridge plat	Equip- & Maint plat	Total hq & H&S	Squad hq	Plat hq	Co hq	Total co		
1			Boat, 25-foot, power, utility	1					1								
2			Bridge, floating, treadway, steel widened	1					1								
3			Compressor, air, truck-mounted, 105 cfm	5						1					1	1	
4	(*)	(*)	Crane, truck-mounted, ¾-cu-yd	3						3							
5			Grader, road, motorized, 13-foot moldboard	2						2							
6	(*)		Semitrailer, low-bed, 20-ton	6						2					1	1	
7	(*)		Shop equipment, motorized, general purpose	1	1												
8			Tractor, crawler type, D4, 8600-12,000 DBP, w/bucket loader and bulldozer	1						1							
9	(*)		Tractor, crawler type, D7, 17, 100-24,000 DBP, w/angle-dozer	5							1				1	1	
10			Trailer, 2-wheel, pole type, slip, 2½-ton, w/bolster	2					2								
11			Trailer, 2-wheel, utility, 2½-ton, type 1	39					3					1		9	

To transport the battalion by air, substantial equipment substitutions must be made as indicated in the table. Small arms and crew-served weapons are also shown in table I and are assigned as indicated in the applicable T/O&E.

6. COMPARISON WITH OTHER ENGINEER COMBAT BATTALIONS

a. Personnel. Although generally similar, the organizations of the engineer battalions do vary with the three types of division—airborne, armored, and infantry (fig. 3). The principal differences are in bridging and strength. The differences in bridging are: the engineer combat battalion, divisional, and the airborne engineer battalion each have one bridge platoon; the engineer combat battalion, army,

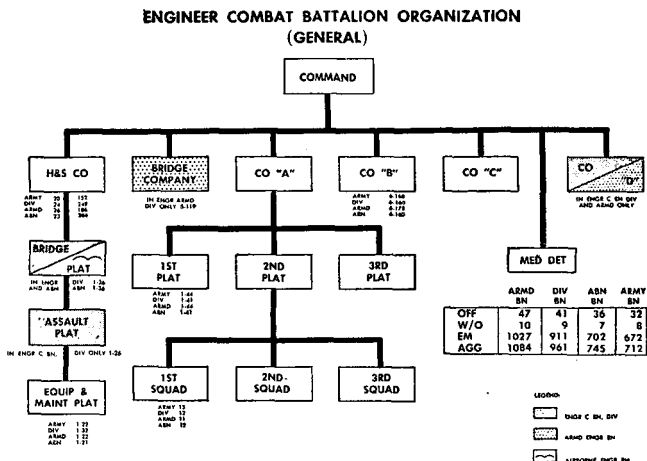


Figure 3. Comparison of strength and organization of engineer combat battalion.

has none; the armored engineer battalion has two bridge platoons in its bridge company. The differences in strength are: the engineer combat battalion, divisional, has one more combat company than the airborne engineer battalion and the engineer combat battalion, army; it also has an assault platoon that none of the other battalions have.

b. Equipment. The engineer combat battalion, divisional, has more construction and earth-moving equipment than the engineer combat battalion, army, and the airborne engineer battalion. It has approximately the same amount of equipment as the armored engineer battalion.

c. Capabilities. The engineer combat battalion, divisional, has a greater capability for general engineer work than either the airborne engineer battalion, the armored engineer battalion, or the engineer combat battalion, army. It gains this advantage over the engineer combat battalion, army, and the airborne engineer battalion only because of its size, and over the armored engineer battalion because the latter must train extensively for its more specialized work. Similarly, the engineer combat battalion, divisional, is the most versatile of the engineer units in infantry combat. It is not as effective in close combat, however, as an infantry battalion, because it has less training in infantry tactics, fewer crew-served weapons, and no recoilless rifles or specialized communications.

7. ASSIGNMENT

The engineer combat battalion, divisional, is organic to the infantry division, T/O & E 7N (fig. 4).

Table II. Comparison of Major Items of Equipment in Engineer Combat Battalions

	C-119B	C-124A	Supply service	Unit	Engineer combat battalion, divisional T/O & E 5-15N 3 May 1948	Engineer combat battalion, army T/O & E 5-35 15 Sept. 1948	Armored engineer battalion T/O & E 5-215N 22 Apr. 1948	Airborne engineer battalion T/O & E 5-225 1 Apr. 1950
•								
1	---	---	A	Aircraft, army-----	0	1	0	0
2	---	---	A	Helicopter-----	0	0	0	1
3	---	---	E	Boat, 25-foot, power, utility-----	1	0	2	1
4	---	---	E	Bridge, fixed and floating, divisional, 50-ton.	0	0	0	1
5	---	---	E	Bridge, floating, treadway, steel, widened.	1	0	2	0
6	---	---	E	Compressor, air, truck-mounted, 105 cfm.	5	4	6	4
7	(*)	(*)	E	Crane, truck-mounted, ¾-yard-----	3	2	4	3
8	---	---	E	Grader, road, motorized, 13-foot moldboard.	2	0	2	2
9	(*)	---	E	Semitrailer, low-bed, 20-ton-----	6	5	7	4
10	---	---	E	Trailer, full, low-bed, 8-ton-----	0	0	0	4
11	(*)	---	E	Shop equipment, motorized, general purpose.	1	1	1	1

12	---	E	Tractor, crawler type, 8,600-12,000 DBP, D4, w/bucket loader and bulldozer.	1	1	1	1
13	---	E	Tractor, crawler type, 8,600-12,000 DBP, D4, w/bulldozer.	0	0	0	3
14	---	E	Tractor, crawler type, 12,100-17,000 DBP, D6, w/angle-doz.	0	0	0	4
15	(*)	E	Tractor, crawler type, 17,100-24,000 DBP, D7, w/angle-doz.	5	4	6	0
16	---	E	Trailer, 2½-ton, pole type, w/bolster.	2	0	4	2
17	---	E	Trailer, 2½-ton, pole type-----	39	27	18	30
18	(*)	E	Trailer, type VIIIA, powerboat--	1	0	2	1
19	---	E	Truck, 2½-ton, bolster body-----	2	0	4	2
20	(*)	E	Truck, cargo, treadway, 6-ton----	18	0	36	18
21	---	E	Water purification equipment, diatomite set.	4	4	4	4
22	---	E	Welding equipment, electric arc, Set No. 1.	2	2	2	1
23	---	O	Carbine, .30 cal.-----	140	104	165	90
24	---	E	Gun, machine, cal .30 light-----	26	20	28	18

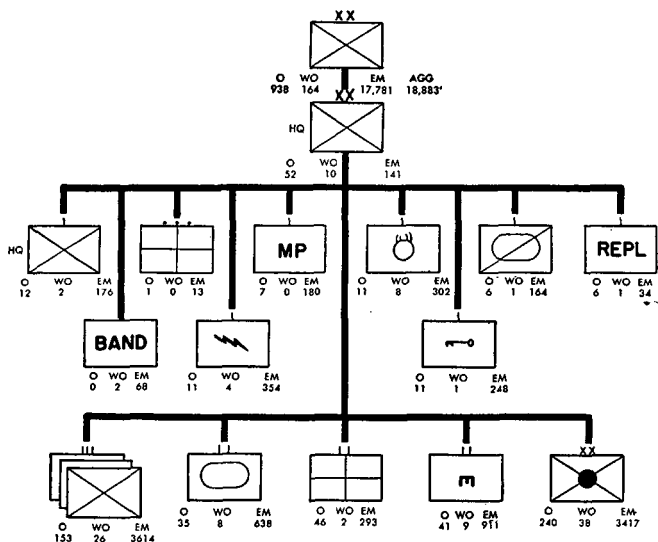
*Not air-transportable.

Table II. Comparison of Major Items of Equipment in Engineer Combat Battalions—Continued

	C-119B	C-124A	Supply service	Unit	Engineer combat battalion, divisional T/O & E 5-15N 3 May 1948	Engineer combat battalion, army T/O & E 5-35 15 Sept. 1948	Armored engineer battalion T/O & E 5-215N 22 Apr. 1948	Airborne engineer battalion T/O & E 5-225 1 Apr. 1950
•								
25	---	---	O	Gun, machine, cal .50, HB	28	18	32	24
26	---	---	O	Gun, submachine, cal .45	65	40	117	53
27	---	---	O	Launcher, rocket, 3.5-inch	40	31	44	31
28	---	---	O	Pistol, automatic, cal .45	30	4	65	393 or 467
29	---	---	O	Rifle, cal .30	729	559	753	583
30	(*)	(*)	O	Tank, medium, w/bulldozer	5	0	12	0
31	---	---	O	Trailer, ¼-ton	33	27	33	31
32	---	---	O	Trailer, 1-ton	35	26	42	27
33	---	---	O	Trailer, 1-ton, water tank, 250-gal.	5	4	6	4
34	---	---	O	Truck, ¼-ton	33	27	33	31
35	---	---	O	Truck, ¾-ton, ambulance, KD	1	1	2	1
36	---	---	O	Truck, ¾-ton, cargo	15	12	15	23
37	---	---	O	Truck, ¾-ton, command, weapons carrier.	7	5	7	1
38	---	---	O	Truck, 2½-ton, cargo	6	5	7	4

39	---	O	Truck, 2½-ton, dump	---	75	54	61	51
40	---	O	Truck, 4-ton, cargo	---	0	0	0	4
41	(*)	O	Truck, tractor, 6-ton	---	6	5	7	4
42	(*)	O	Truck, wrecker	---	1	1	1	1
43	(*)	O	Vehicle, armored, personnel carrier.	---	0	0	43	0

*Not air-transportable.



INFANTRY DIVISION, T/O&E, 7N, 7 JULY 1948, AS AMENDED

Figure 4. Infantry division.

It should not be confused with the engineer combat battalion, army, which is an engineer component of corps and army.

8. CAPABILITIES

The engineer combat battalion, divisional, can furnish engineer support for the infantry division in normal operations. It can—

- Provide necessary engineer staff planning and supervision for the infantry division, including that required for attached and supporting engineer troops.
- Conduct tactical and technical reconnaissance.
- Construct, repair, maintain, and mark roads and trails.

d. Construct, improve, reinforce, and maintain fords, fixed bridges, and culverts.

e. Construct, maintain, and repair floating bridges and ferries.

f. Transport infantry elements across rivers with assault equipment.

g. Construct and remove obstacles, including mine fields.

h. Execute demolitions.

i. Assist in the assault of fortifications.

j. Construct or assist in the improvement of command posts, shelters, and defensive installations.

k. Prepare landing strips for army aircraft.

l. Establish and operate water points.

m. Provide engineer supply service for the infantry division.

n. Procure and distribute maps.

o. Collect, evaluate, and disseminate engineer intelligence.

p. Prepare and post route-marking signs.

q. Provide limited utilities, except signal.

r. Survey and map small areas.

s. Fight as infantry in emergencies.

t. Provide technical advice and assistance, to include assistance in conducting engineering training.

CHAPTER 2

ENGINEER COMBAT COMPANY

Section I. GENERAL

9. MISSION

The engineer combat company is an operating component of the engineer combat battalion, divisional, in performing general engineer work contributing to the combat effectiveness of the infantry division. It is the basic administrative unit within the battalion. It is equipped to perform combat engineer tasks and, when reinforced with additional heavy equipment, can perform heavy engineer tasks. It fights as infantry in an emergency. It normally can provide engineer support for one infantry regiment and its supporting troops.

10. ORGANIZATION

The engineer combat company is organized into a company headquarters and three identical platoons (fig. 5).

11. EQUIPMENT

The company is completely mobile in its organic vehicles. In addition to individual arms, it has machine guns and grenade and rocket launchers for offensive and defensive operations. It also has many

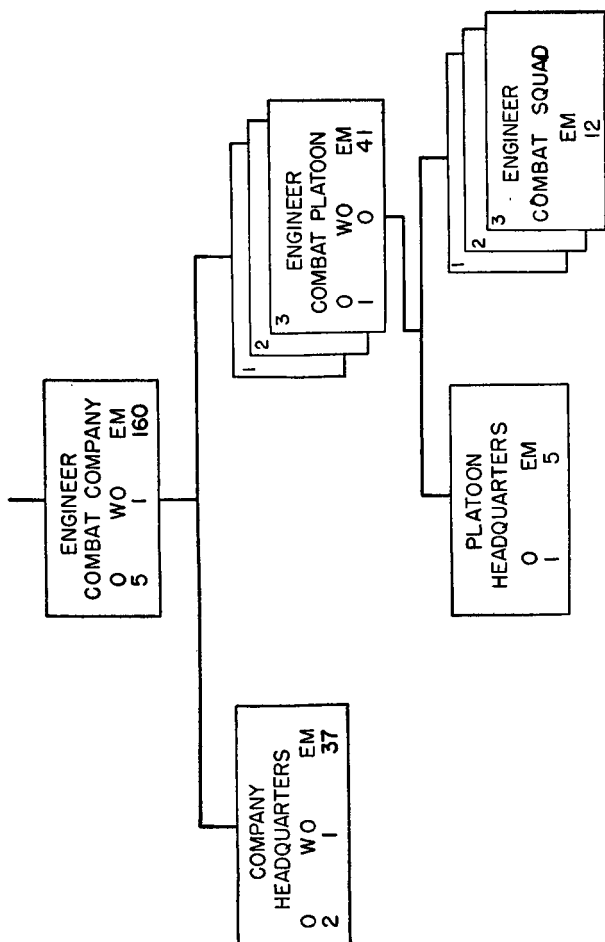


Figure 5. Organization of engineer combat company.

items of administrative, operational, and housekeeping equipment. Radios and other items of signal equipment are provided for communication between squads within each platoon, between platoon and company, and between company and battalion or supported unit. Squad and platoon carpenter, pioneer, and demolition sets and several pieces of engineer heavy equipment are also organic to the company. See table I for major items of equipment and figure 34 for radio nets.

Section II. SQUAD

12. MISSION

The squad is the basic unit of the company. Its function is to mold individuals into one smooth working unit. It can work independent of a parent unit for only short periods of time. It receives task assignments when the company or platoon is working as a unit. In a sense the squad replaces the family. It is therefore an important social unit in the development of the private into a first-rate soldier.

13. ORGANIZATION

The squad consists of a squad leader (combat construction foreman), assistant squad leader (combat construction specialist), and additional combat construction specialists, pioneers, and a light-truck driver (fig. 14①).

Section III. DUTIES OF SQUAD PERSONNEL

14. SQUAD LEADER

The squad leader is in the direct line of command: company commander, platoon commander, platoon sergeant, and squad leader. He is responsible for the discipline, appearance, training, control, and conduct of his men. Under the platoon leader's direction, he arranges for the feeding, supplying, and equipping of his men when they are working alone. He enforces rules of personal hygiene and sanitation, and checks to see that squad tools, equipment, weapons, and transportation are maintained in serviceable condition. He must be familiar with combat engineering and pioneer construction principles, so that he can properly supervise and inspect the squad's work. He must be familiar with infantry tactics in order to lead his squad effectively when it is employed as infantry in combat. He must be fully acquainted with the duties of combat construction specialists (par. 16) and must have the qualifications of a combat construction foreman (par. 33).

15. ASSISTANT SQUAD LEADER

The assistant squad leader is a combat construction specialist. He performs duties assigned him by the squad leader. He normally works with other squad members in performing squad tasks and is put in charge of squad security details. He supervises the maintenance of squad equipment and expedites squad supply. He may command part of the squad, or in the squad leader's absence, the whole squad. He must possess squad leader qualities and be prepared to take command of the squad at any time.

16. COMBAT CONSTRUCTION SPECIALISTS

a. Combat construction specialists supervise and assist in the construction and repair of roads and bridges; the removal, demolition, or preparation of obstacles; the laying and clearing of mine fields; and the setting and removal of booby traps. They construct, maintain, and repair temporary structures of various types. They supervise and assist in general rigging; raise and move heavy equipment and material by means of gin poles, A-frames, chain blocks, and cableways, set up braces and rig hoisting equipment; and splice rope and cable. They construct, maintain, and repair airstrips for use by Army type aircraft. They help conduct engineer reconnaissance, and help in the assembly and operation of stream-crossing equipage.

b. Combat construction specialists must be fully acquainted with the duties of the pioneers (par. 17) and have a thorough knowledge of the engineering equipment and tools used in hasty construction and repair work on roads, bridges, and fortifications. They must know the characteristics of all materials used in demolition operations; how to interpret and prepare reports concerning demolition and barrier tactics; the combat principles, tactics, and techniques of infantry squad and platoon; and the employment of individual and organizational crew-served weapons. They must be able to read and understand military signs, symbols, and maps, and have an elementary knowledge of camouflage.

c. Two of the combat construction specialists are trained especially to be demolition men. As such, they use squad, individual, and at times the platoon

demolition sets. They compute, prepare, and fire explosive charges. They must have a knowledge of all military explosives and related devices, whether used for destruction or construction. They must be familiar with the fundamentals of electricity covering open, closed, and short circuits.

17. PIONEERS

a. The pioneers perform the same type of tasks as the combat construction specialists, but on a lower level of skill. With additional training, and on successful completion of tests, they may advance to combat construction specialists.

b. One member of the squad receives additional training in the operation of engineer construction equipment. He then may serve as an assistant or second-shift operator for equipment furnished with a regular operator to the squad. He may serve as principal operator for any Class IV or other equipment furnished the squad without an operator. Although trained in the general operation of construction equipment, the squad operator will normally specialize in the operation of one particular type of equipment. The platoon commander controls the specialization, to insure having a qualified crane and shovel operator, a dozer operator, and a grader operator within the platoon. These specially trained men may also be required to operate captured enemy equipment.

18. TRUCK DRIVERS

Truck drivers are responsible for the operation, concealment, camouflage, and driver maintenance of

their vehicles. They also assist the mechanics in organizational maintenance of their vehicles. Each driver is responsible for the proper operation and maintenance of any vehicle he operates. These include correct loading, driving, servicing, inspecting, cleaning, tightening, and care of the vehicle and its tools and accessories. If the vehicle pulls a trailer, the driver has the same responsibilities for the trailer as for the vehicle. Driver preventive maintenance services include: before-operation service; during-operation service; at-halt service; after-operation service; and a weekly service as shown on the trip ticket. Defects beyond the scope of driver maintenance are noted on the trip ticket and reported. When not occupied with his driving duties, the truck driver assists other members of the squad in performing engineer missions.

Section IV. SQUAD EMPLOYMENT AND PIONEERING OPERATIONS

19. SQUAD EMPLOYMENT

The squad normally functions as a part of the platoon or independently as a unit under platoon control. Occasionally, when attached to a small task force, it may be given an entirely separate engineer mission. Frequent employment of a platoon by separate squads should be avoided. Division of this sort causes dispersion, dissipates reserves, and prevents planning and direction by the platoon commander. Tasks requiring two squads should be assigned to "a platoon less one squad" rather than to two squads. Breakdowns beyond squads are avoided

because they contribute to improper supervision and command.

20. PIONEERING

a. Construction. The construction capabilities of the squad are limited by the number of men and amount of construction equipment. The squad erects small buildings, bridges, culverts, and obstacles. It builds and maintains roads and trails. On large projects, the squad is employed on a unit task. For example, during bridge construction, a squad makes up the decking, abutment, or pier crew. When heavy equipment is attached from the battalion pool or other sources, the squad can do much more work.

b. Destruction. The squad with its demolition and pioneer sets, an attached dozer, and by expedient means, is capable of performing small demolition tasks. The squad demolition men can compute, prepare, and execute small demolition jobs (fig. 6). They can also supervise other members of the squad in demolition tasks. The equipment operator assists in operating the dozer when one is available for squad use on certain tasks.

c. Reconnaissance. Members of the squad conduct reconnaissance singly, in pairs, in small groups, and in squad formations. The information sought may be engineer or combat in nature. The search is normally made by vehicle, but may be made on foot. It is normally made by the squad leader or assistant squad leader, assisted by a combat construction specialist, plus such other members of the squad as may be necessary for security. One combat construction specialist is normally assigned to aid in bridge recon-

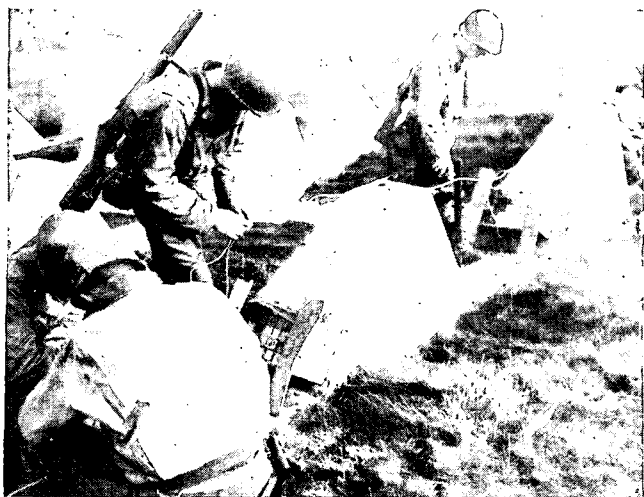


Figure 6. Engineers preparing to blast a lane through "dragon's teeth" in the Siegfried Line.

naissance; the demolition men, to aid in demolition reconnaissance; and the equipment operator and perhaps a pioneer, to aid in reconnaissance of projects involving earth moving and handling of materials. Missions requiring the entire squad are normally limited to combat reconnaissance in force and to the general search of an area for engineer materials. The area searched can be broken down into subareas, each covered by one or two men of the squad. Members of the squad are always alert to observe and report items of informational value in their area of operation.

Section V. ENGINEER SQUAD COMBAT OPERATIONS

21. THE ADVANCE AND ATTACK

Squad operations in the advance and attack are largely concerned with facilitating the movement of men and vehicles. The squad detects and removes mines and booby traps (fig. 7), clears road blocks and other obstacles, makes hasty repair of bridges and roads, does hasty construction of bypasses, fills craters, posts signs, and conducts reconnaissance. It may also place demolitions and construct obstacles to protect the flanks and rear of attacking units.

22. THE DEFENSE

In a defensive situation, the squad conducts engineer reconnaissance, constructs obstacles (fig. 8), including mine fields and booby traps, prepares field fortifications, supervises camouflage, and assists in clearing fields of fire. In an emergency, the squad may be committed as infantry, as a part of its platoon, after reorganization for that task.

23. RETROGRADE MOVEMENT

To facilitate the movement of retiring columns, the squad performs the engineer tasks of maintaining roads, bridges, and fords, and of filling craters. It helps to delay the enemy by aiding in the preparation of successive defensive positions and by destroying bridges, blocking roads, executing demolitions, erecting obstacles, and placing mines and booby traps. The squad may also evacuate or destroy material and may be called on to defend obstacles.



Figure 7. Engineers clearing field of bombs used as mines.



Figure 8. Two members of an engineer squad erecting barbed wire.

24. RIVER-CROSSING OPERATIONS

a. In a deliberate river-crossing operation the squad performs unit tasks within the platoon. Appropriate tasks include operation of assault crossing equipment, operation of rafts and ferries, work on bridge approaches, and improvement of assembly areas.

b. In hasty crossings the role of the squad is more difficult to foretell. If the hasty crossing involves the seizure of an enemy bridge intact, the squad may be required to neutralize or remove explosive charges, or to make hasty repairs. If the crossing must be made without use of an existing bridge, the squad acts as part of the platoon as in a deliberate crossing.

25. SECURITY

The squad may provide security for a platoon-size work detail. However, the use of an improvised weapons squad is generally preferable. When attack by a large force is unlikely, the squad may provide security for a company. The squad may also provide security for a bivouac up to company size or for a company command post. It may also be used as a point when the battalion is making a foot march.

26. COMBAT AS INFANTRY

When an engineer unit is committed as infantry, the squad is reorganized and operates as an infantry squad. See appendix III for reorganization and FM 7-10 for infantry doctrine.

Section VI. SQUAD TRAINING

27. INDIVIDUAL TRAINING

Members of the squad must receive both basic individual and advanced individual training after reporting to the squad, if they have not previously had this training. The subjects to be covered and the time required are set out in ATP 5-300. Advanced individual training for occupational specialties prescribed in the tables of organization may be accomplished in a variety of ways. Normally, sending students to a full-time specialist training school is preferable when quotas are available. Alternatively, part-time schools are sometimes operated by a higher responsible headquarters for certain of the required specialists. When no outside training is available these specialists must be trained within the company, following appropriate programs of instruction from The Engineer School. After the initial training of the squad has been completed, replacements may be trained by having them understudy qualified specialists on the job.

28. SQUAD UNIT TRAINING

Squad unit training follows ATP 5-300 which prescribes a program of training for the squads of the divisional engineer combat battalion. This program stresses such subjects as: combat principles, security, demolitions, reconnaissance, bridging, mines and mine fields, wire and obstacles, road construction, general construction, and field exercises. One important object of the unit training phase is to achieve an organization that works well as a team on any

assigned task. Practice in working together is essential if efficiency is to be achieved. Additional information on training may be found in section II, chapter 5 of this manual.

29. TRAINING OTHER ARMS AND SERVICES

The squad of the engineer battalion is used for demonstrations and direct training of nonengineer units within the division in such subjects as:

- a.* Laying, recording, and removal of antitank mines.
- b.* Technique of camouflage.
- c.* Construction and removal of road blocks and other obstacles.
- d.* Expedient bridging and road construction.
- e.* Use of explosive.

Section VII. PLATOON

30. MISSION

The platoon is the main operational component of the engineer combat company, but it can not provide its own administration and supply. The capabilities of a platoon in construction work are limited by its equipment, personnel, and the amount of time permitted for a job. It performs pioneering and combat missions in support of other arms and services, and is normally the smallest engineer unit used in a supporting role. With additional equipment attached from company or battalion, the scope of the platoon's operations can be greatly increased. In a large-scale operation, such as a deliberate river crossing, the platoon is used as part of a larger unit for

greater efficiency. In all operations, the platoon headquarters functions as a coordinating and supervising agency for the squads.

31. ORGANIZATION

The platoon consists of a platoon headquarters and three identical squads. The organization of the squads is given in paragraph 13 and figure 14①. Detailed organization and equipment of the platoon headquarters are shown in figure 14②.

Section VIII. DUTIES OF PLATOON HEADQUARTERS PERSONNEL

32. PLATOON LEADER

The platoon leader is responsible for the discipline, training, performance, supply, and welfare of his platoon. It is essential for him to know the capabilities and personal characteristics of each of his men. His main duties are to—

a. Analyze the platoon task and assign work to his subordinates, making full use of squad organization.

b. Allocate personnel and equipment from platoon headquarters, where necessary to help the squads.

c. Supervise execution of the work and see that work parties are efficiently organized, correct methods are used, supply of material is maintained, difficulties are anticipated and provided for, equipment is efficiently used, and proper security measures are taken at all times.

d. Encourage the platoon sergeant and squad leaders to handle details of design and construction

to the limit of their capacities on assigned projects or tasks.

e. Obtain equipment from company and battalion headquarters, when necessary to supplement platoon equipment.

f. Insure that tools, equipment, weapons, transportation, and clothing are adequate, serviceable, and properly maintained.

g. Insure that all classes of supply are properly used.

h. Make engineer reconnaissance rapidly, accurately, and continuously, and disseminate information properly and promptly.

i. Provide liaison with an act as engineer staff adviser for the unit his platoon supports.

33. PLATOON SERGEANT

The platoon sergeant is a combat construction foreman and second in command of the platoon.

a. Duties.

- (1) Help the platoon commander supervise enlisted specialists engaged in combat construction, repair, and demolition operations.
- (2) Perform engineer reconnaissance.
- (3) Study pertinent terrain maps and aerial photographs, and reconnoiter areas to observe such details as roads, bridges, fords, and water-supply sources.
- (4) Make rough sketches of important areas and report information obtained.
- (5) Assist with organization of work activities and supervise operations.

- (6) Visit work sites at periodic intervals to make vital inspection of quality and progress of work.
- (7) Keep informed on adequacy of equipment and supply of construction material.
- (8) Instruct subordinate personnel in demolition operations, combat construction, and repair activities, such as placement of explosives to insure effective demolition, patterns for hasty and deliberate mine fields, placement of culverts, and erection of road blocks.
- (9) Demonstrate proper method of performing tasks.

b. Qualifications.

- (1) Must be fully acquainted with the duties of combat construction specialists (par. 16).
- (2) Must have knowledge of combat construction methods and recognized combat construction expedients, including military fixed and floating bridging.
- (3) Must know the capabilities and limitations of the engineering equipment and tools used in combat construction, and be skilled in the interpretation of maps, aerial photographs, blueprints, and engineer specifications.
- (4) Must be able to employ all weapons under his control and instruct others in their use.

34. ASSISTANT PLATOON SERGEANT

The assistant platoon sergeant is a combat construction foreman. He performs duties assigned him by the platoon sergeant and commands the

platoon when both the platoon commander and platoon sergeant are absent. He takes charge of security on platoon tasks and is the weapons sergeant when the platoon reorganizes for combat as infantry. He is the principal assistant to the platoon commander in the procurement of construction supplies.

35. TOOLROOM KEEPER

The toolroom keeper maintains the platoon headquarters tools and sharpens and makes minor repairs on squad tools. When the tools of his platoon are kept in the company supply room, he performs various duties under the company supply sergeant in connection with the issue and storage of the platoon and squad tools.

36. TRUCK DRIVERS

Drivers duties are given in paragraph 18. The driver of the $\frac{1}{4}$ -ton truck also operates the radio mounted in the vehicle and the hand radio, as required.

Section IX. PLATOON EMPLOYMENT AND PIONEERING OPERATIONS

37. PLATOON EMPLOYMENT

a. The platoon may be given an area assignment in which it is responsible for all engineer work in a given area, or it may be given a task assignment. A platoon area assignment is broken down into squad tasks. An example of a platoon area assignment is

road maintenance and repair for an entire designated area. A platoon task assignment, such as constructing a tactical bridge or a new road, may require the entire platoon; or a task, such as a small mine-clearing operation, reconnaissance mission, or construction of small obstacles, may require parts of a platoon. The platoon commander adapts the size of the detail to the task. The platoon may operate independent of its company for short periods only. During this time, enough company headquarters personnel, such as maintenance personnel, should accompany the platoon to allow it to expend its full effort on the task. For continuous operations, relief is usually planned and provided by the company commander, although the platoon can operate by shifts.

b. The platoon is able to absorb reinforcing equipment easily, and to keep it in continuous operation. The platoon headquarters acts as a distribution agency to the squads for supplies used in operations.

c. The platoon may be employed in direct support of an infantry battalion or regiment, or in general support of the same unit under company control. However, the platoon is normally employed in engineer tasks by the parent company commander. Under certain tactical situations, when communications and control are difficult, it may be necessary to attach the platoon to another unit.

38. PIONEERING

a. Construction. The platoon can construct and repair small timber bridges, construct jeep trails, maintain roads, and build and maintain ferries,

fords, and culverts (fig. 9). It can also lay mine fields and construct all types of obstacles. The speed and efficiency of construction operations are increased by attaching company or battalion equipment to the platoon for specific jobs. The platoon with attached dozers, and graders if available, can



Figure 9. Engineers building a box culvert.

prepare a landing strip for divisional aircraft. The platoon is not adequate, however, for a large construction job, such as the assembly of a large floating bridge which requires a company or battalion.

b. Destruction. The platoon can breach or destroy most types of obstacles through the use of explosives, attached dozers, and expedients. It can also perform all types of military demolitions with the demolition sets provided in the platoon headquarters and squads.

c. Reconnaissance. The platoon may be required by the company commander to operate engineer reconnaissance patrols. These patrols are normally of squad size and are placed under command of squad leaders. They search in designated areas for specific information and items. When no specific reconnaissance missions are assigned, it is standing operating procedure for the platoon to maintain continuous engineer reconnaissance in its assigned area of operations.

Section X. ENGINEER PLATOON COMBAT OPERATIONS

39. THE ADVANCE AND ATTACK

In the advance and attack the platoon may operate as part of the company in support of an infantry regiment or, during rapidly moving situations, may independently support advanced or mechanized units. In aiding the advance, the platoon commander maintains close coordination with the leading infantry elements to insure that the advance is not held up by features which can be reduced, by-

passed, or otherwise overcome by the platoon. Advance engineer reconnaissance is conducted continuously to discover and immediately complete engineer work or, when necessary, to allow time for securing help from company or battalion. The platoon is the normal engineer unit employed with the advanced guard of an infantry regiment in the advance. In the attack, an engineer company commander normally provides one or more platoons in direct support of the attacking infantry battalions with the balance of the company in general support of the infantry regiment. Typical platoon tasks in the advance and attack include:

a. Conducting engineer reconnaissance.

b. Removing or breaching obstacles in roads, including mines, booby traps, all types of erected obstacles, and debris.

c. Repairing roads and streets, including making expedient and hasty road repairs and filling craters.

d. Constructing, strengthening and repairing small bridges; improving fords (fig. 10); and operating ferries.

e. Placing demolitions; laying mine fields, and constructing obstacles on the flanks and rear of an advancing unit.

40. THE DEFENSE

In the defense, the platoon can furnish technical advice and aid to the supported unit in setting up the defensive position. The engineer assistance is usually limited to those tasks requiring special technical skill, or those beyond the capabilities of the supported unit. Such tasks are to—



Figure 10. Engineers using steel mat to build a ford.

a. Aid in preparing defensive positions and weapons emplacements (fig. 11).

a. Lay and record defensive mine fields.

c. Erect or supervise erection of wire entanglements, road blocks, and other obstacles.

d. Issue field fortification materials (when not issued directly by the engineer company or battalion S4).

e. Assist in camouflage.

f. Prepare and execute demolitions.

41. RETROGRADE MOVEMENTS

In a retrograde movement the platoon prepares successive defensive positions previously selected and

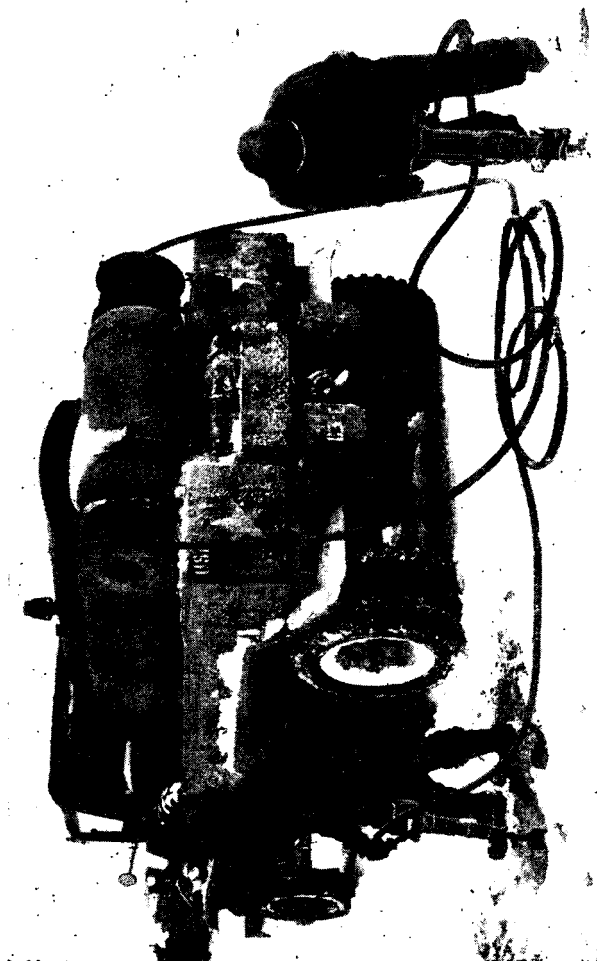


Figure 11. Engineers using an air compressor and pneumatic tools.

planned by the supported unit; aids the rearward movement of vehicles, artillery, and troops; and evacuates or destroys matériel. The platoon may help destroy supplies held by the other services (quartermaster and ordnance in particular) through the use of explosives. The principal duty of the platoon in a retrograde movement is normally to help delay the enemy. The platoon constructs and sometimes defends road blocks and other obstacles. Bridges, culverts, defiles, abatis (fig. 12), and sidehill cuts are prepared for demolition. If they cannot be blown immediately because of the passage of friendly troops, the platoon blows them on order from higher headquarters or when necessary to prevent capture.

42. RIVER-CROSSING OPERATIONS

a. When called on for an active part in a deliberate crossing operation, the platoon acts under direct control of the company commander and is given a unit task. The nature of the task depends on the number of engineer troops available and the requirements of the operation. Normally, division engineer troops are given tasks which will not prevent them from supporting the infantry units which cross the river and operate on the hostile shore. Typical platoon tasks include operating assault boats in the first wave of the crossing, furnishing guides for assault boats in succeeding waves, building access roads to the bridge site, maintaining roads, improving assembly areas, and furnishing engineer support to infantry units on the far shore.

b. In the hasty crossing, expedients are the rule. Prompt advantage must be taken of the enemy's dis-



Figure 12. Engineers prepare trees for "blowing" to form an abatis.

organization or absence. Therefore, whatever means are at hand must be used to get troops across as quickly as possible. The opportunity for a hasty crossing is usually presented to a small striking force such as a regimental combat team or smaller unit. These forces usually include a company or platoon of the engineer battalion. The work done by the platoon includes such tasks as: construction of a ford, mine clearance on the shores, bridge repair, removal of explosives from a bridge captured intact, or seizure and operation of civilian boats. If standard military bridging or boats are available, the platoon carries troops across in assault boats (fig. 13) or infantry support rafts.

43. SECURITY

The engineer platoon may be used as the security detail for an engineer company or for an engineer battalion, depending on the tactical situation. The security may be furnished for a work party, a bivouac, a headquarters, or a march column. When protecting a column, a platoon may serve as part of an advance guard, rear guard, or flank security. The engineer platoon normally does not provide security for units other than those within the engineer battalion.

44. COMBAT AS INFANTRY

The platoon does not ordinarily fight as infantry, but can be so committed if necessary. It operates the same as an infantry rifle platoon, with three rifle squads and one provisional weapons squad. See ap-

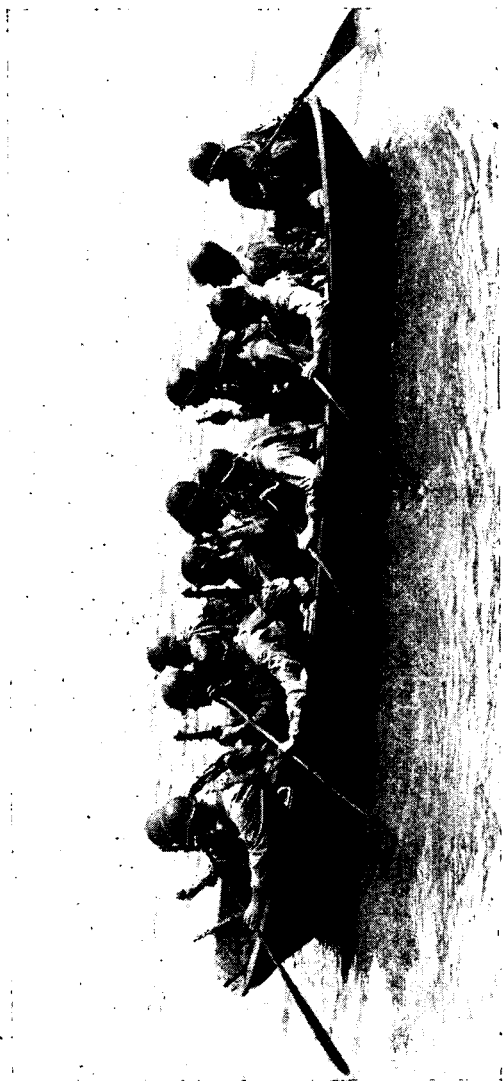


Figure 13. Assault boat carrying an infantry squad and a three-man crew of engineers.

also FM 7-10 for standard infantry doctrine. Appendix III for use of the platoon as infantry. See

Section XI. PLATOON TRAINING

45. GENERAL

The platoon commander is responsible for training his platoon to operate efficiently as a unit and as part of the company. Training of individual members of the squads and of the squads as units is described in section VI above. Training of the individuals of platoon headquarters in basic military and technical subjects follows ATP 5-300, although such training will normally have been accomplished before the individuals are assigned to platoon headquarters. Advanced specialist training of these individuals follows ATP 5-300 and may be conducted in unit or other schools, or by on-the-job training. Unit training of the platoon follows ATP 5-300. In training, the identity of the squads must be preserved and the work of the three squads correlated by the platoon command group. Unit training must form the squads into an efficient platoon team. See also section II, chapter 5.

46. TRAINING OTHER ARMS AND SERVICES

The role of the platoon in the training of other arms and services is twofold. An individual, usually the platoon commander or one of the noncommissioned officers, lectures, and the platoon as a whole demonstrates methods and procedures. The subjects covered normally include: mines and mine fields,

booby traps, camouflage, expedient bridging, expedient road construction, use of ferries and assault boats, and military explosives. The whole platoon is usually required to demonstrate the techniques of laying, marking, and recording a mine field and of gapping and clearing enemy fields. The demonstrations of expedient road construction, ferry operation, camouflage, and explosives can be staged by a single squad.

Section XII. COMPANY HEADQUARTERS

47. MISSION

The mission of the company headquarters is to provide command, administration, and equipment support for the platoons of the company. This includes planning, direction, supervision, supply, subsistence, maintenance, and clerical service.

48. ORGANIZATION

Personnel of company headquarters are arranged, according to the nature of their duties, into the command echelon and the administrative echelon. The personnel and organization of the company headquarters are shown in figure 14③.

Section XIII. COMMAND ECHELON

49. ORGANIZATION

The command echelon is composed of the company commander, executive officer, first sergeant, light-truck drivers, and fillers, who are grouped as command personnel; and the radio operators and a radio mechanic, who are grouped as the communication section.

ENGINEER COMBAT COMPANY




SQUAD (9)	PLATOON HQ (3)	COMPANY HQ
 201 TRK CUM W/POLE TLE SQUAD LEADER (Const Foreman) SFC ASST SQUAD LEADER (Combat Const Spec) SGT COMBAT CONST SPEC CPT COMBAT CONST SPEC CPT DML MAN SGT DML MAN CPT PIONEER (Const Equip Opr) PFC PIONEER PFC PIONEER PVT PIONEER PVT DRIVER TRK LT PFC	 1/1 TRK W/AT TLE 2/1 TRK CUM W/CARGO TLE PLATOON COMMANDER LT PLATOON SGT (Const Foreman) M/SGT ASST PLATOON SGT (Const Fore Asst) SFC DRIVER TRK LT PFC DRIVER TRK LT PFC TOOLROOM KEEPER PFC	 1/1 TRK W/AT TLE 2/1 TRK CUM W/CARGO TLE 3 REC 1/1 TRK 2/1 TRK CARGO W/WATER TLE COMPRESSOR AIR TLE AND 61 TRK W/101 TLE CARRYING DOZER
TOTAL 12	TOTAL 1 5	TOTAL 2 1 37

Figure 14. Personnel and vehicles of engineer combat company.

50. COMMAND SECTION

a. Duties of Command Personnel.

(1) *The company commander* of a combat company has duties common to all engineer company commanders. He is solely responsible to the battalion commander for the administration, operations, training, discipline, supply, and appearance of his company. Among his duties are—

- (a) Aiding the battalion commander and battalion staff in developing plans for the employment of his company. This includes maintaining liaison with the battalion commander and battalion staff and keeping them informed of the company situation and of operational changes that he considers necessary for the efficient employment of his company.

Exercising initiative to keep his company constructively employed when no missions are assigned or requested.

- (c) Analyzing a task, dividing it into its components, and allotting work to his subordinate commanders.
- (d) Supervising the execution of work to see that: tasks are carried out properly; correct methods are used; the supply of materials is maintained; difficulties are anticipated and provided for; and the platoon commanders are given all possible facilities, including personnel and equipment from company headquarters

or battalion, to help them execute their assigned work.

- (e) Inspecting tools, equipment, weapons, transportation, and all classes of supply to insure that they are properly maintained, used, or stored; and that the mess, supply, communication, administration, and maintenance sections are operating properly.
 - (f) Conducting continuous engineer reconnaissance and reporting appropriate information to battalion headquarters, to the unit which he supports, and to his platoons.
 - (g) Providing liaison with and engineer staff advice for the unit he supports.
- (2) *The executive officer* is usually the senior lieutenant in the company and second-in-command. He helps the company commander perform his duties, is his chief adviser on company matters, and assumes command in the company commander's absence. He must be familiar with the company commander's policies, keep himself constantly informed of the company situation, and have the authority to make decisions in the name of the company commander. He may be used as the project engineer on a job requiring two platoons, either simultaneously or on a two-shift basis, in order to coordinate the work and preserve continuity of effort. He may be designated as company liaison officer, when required,

and may be used as the assistant unit engineer for a unit supported by the company. He must be prepared to take over command of any of the platoons or the company at any time.

- (3) *The first sergeant* is normally selected by the company commander from the combat construction foremen, who are assigned to the company, or a combat construction foreman from within the battalion may be transferred by the battalion commander to fill a first sergeant vacancy in the company. The company commander may terminate the designation of first sergeant at any time by company order. The designation of first sergeant is also terminated upon the transfer of an incumbent to another unit. The first sergeant serves as principal enlisted assistant to the company commander in administration and control of the company. Under the unit administrator, he coordinates various activities within the company such as mess, supply, transportation, maintenance, and communications. He helps prepare and maintain records, rosters, correspondence, and reports. He acts as representative between the company commander and enlisted personnel of the company. In the capacity of a construction foreman (par. 33), he aids the company commander in inspecting and supervising training and operations. He assumes the duties of the company commander in the absence of all com-

pany officers, and the duties of the unit administrator in his absence.

- (4) *The truck drivers*, in addition to the duties shown in paragraph 18, operate the radios in the $\frac{1}{4}$ -ton and $\frac{3}{4}$ -ton trucks.
- (5) *The fillers* form a company labor pool or are used as understudies and replacements for other company enlisted personnel.

b. Employment and operations. The command personnel of the company headquarters perform command functions to include: planning, directing, and supervising the operation of the three platoons of the company and company headquarters sections. The company commander uses the radio mounted in the $\frac{1}{4}$ -ton truck to maintain radio communications with the three operating platoons, the company communication section, and the executive officer. The executive officer uses the radio in the $\frac{3}{4}$ -ton truck to contact personnel in the company net when he acts as liaison officer or when he is away from the company command post. See figure 34 for radio nets.

51. COMMUNICATION SECTION

a. Duties of communication section personnel.

- (1) *The radio operators* operate the company radios in the battalion and company nets and perform preventive maintenance on their equipment. They send and receive messages and keep message records. They encipher and decipher messages with the converters, install and operate the emergency switchboard, and use the aircraft

panel signaling sets. One of the radio operators drives the section's $\frac{3}{4}$ -ton truck.

- (2) *The radio mechanic* inspects, tests, and performs organizational maintenance on all company communication equipment. He also can operate the company radios.

b. Employment and operations. The communication section provides the company headquarters with 24-hour radio communication with any of the units in the battalion or company net. The section normally operates at the company command post. See figure 34 for company radio net.

c. Training. The training in general and basic subjects is given with the provisional headquarters platoon (par. 66). Specialist training is acquired as apprentice training, in a battalion or higher-echelon communications school. One radio operator understudies the radio mechanic, and the radio mechanic understudies a radio operator. One radio operator is provided in the cadre.

Section XIV. ADMINISTRATIVE ECHELON

52. ORGANIZATION

The administrative section consists of the unit administrator, the company clerk, the mess section, the supply section, and the equipment and maintenance section. It is commanded by the unit administrator.

53. UNIT ADMINISTRATOR

The unit administrator is a warrant officer. He is the company administrative officer and is a specialist in all phases of company administration. He assists

the company commander in supervising company administration, supply, mess, and transportation activities.

a. He supervises the routine administration of company headquarters. This includes—

- (1) Preparing rosters, reports, correspondence, and unit records.
- (2) Advising enlisted men on such matters as savings, war bonds, insurance, family allotments, and other personal welfare and related subjects, including troop information and education (TI&E).
- (3) Acting as investigating officer (except for investigation of court-martial charges under Article 30 through 35) and member of appropriate courts and boards.
- (4) Acting as agent finance officer or witnessing officer in the payment of troops, when so designated by competent authority.

b. As mess officer, he supervises mess accounting and the proper preparation and serving of food. He conducts inventories and checks on the proper receipt and disposition of rations for compliance with existing directives and regulations.

c. As supply officer, he supervises the requisition, receipt, storage, issue, salvage, and maintenance of supplies and equipment. He conducts inventories of supplies and equipment both in the supply room and in the hands of unit personnel, and checks records of supplies and equipment.

d. As transportation officer, he supervises the inspection and maintenance of company motor vehicles and heavy engineer equipment. He approves rou-

tine operation and directs the special dispatching of vehicles. He supervises inspection for proper care and preventive maintenance. He anticipates maintenance requirements and keeps informed of the location of facilities for major repair and parts supply. He advises the company commander on motor transport problems.

e. He assists in maintaining and policing unit facilities.

54. COMPANY CLERK

The company clerk is an administrative assistant to the unit administrator. He has a portable typewriter and a field desk. He performs various clerical and typing duties at the company level. These duties include typing, filing, maintaining, or posting various personnel reports, orders, company correspondence, training reports, and similar administrative papers. The company clerk is provided in the cadre. He is trained to type accurately 35 or more words per minute and must have a good knowledge of military correspondence. He also is familiarized with all regulations, manuals, and procedures pertaining to administration at the company level, with the T/O&E of the company, and with the military occupational specialties represented therein.

55. MESS SECTION

a. Organization. The mess section consists of a mess steward, first and second cooks, and a cook's helper.

b. Duties of Mess Personnel.

- (1) *The mess steward* supervises and controls the activities of the mess personnel. He prepares menus from the master menu, supervises the preparation and serving of the meals, inspects delivered supplies for condition and quantity, keeps mess records, and sees that proper sanitary and dietetic principles are followed at all times.
- (2) *The cooks* prepare and serve the meals under the direction of the mess steward. They set up, operate, and maintain the field ranges.
- (3) *The cook's helper* helps the cooks prepare and serve the food and maintain kitchen equipment. He also helps set up and camouflage the kitchen, and drives the mess truck.

c. Employment and Operations. The mess section normally operates as a unit to feed the entire company. When platoons of the company are separated from the company bivouac, food for the platoon may be cooked in the company kitchen and transported to the platoon in insulated containers. The 250-gallon water trailer, pulled by the mess truck, is filled with potable water at water points, and kept with the kitchen to supply water for cooking and mess operations. It may be used to haul drinking water to augment the water in organic water cans.

d. Training. The training of the mess section in general and basic subjects is given with the provisional headquarters platoon. Since the mess stew-

ard and six cooks are supplied in the cadre, initial training of a mess section is not a difficult problem. However, replacements must be trained in anticipation of furnishing a cadre to another unit. Specialist schools or apprentice training are used.

56. SUPPLY SECTION

a. Organization. The supply section consists of a supply sergeant, an engineer supply specialist, an armorer, and a light-truck driver.

b. Duties of Supply Personnel.

- (1) *The supply sergeant* supervises the activities of the supply section. Based on the needs of the platoons and sections, he prepares requisitions; he also prepares survey reports, memorandum receipts, and other forms related to the receipt, storage, and issue of supplies. He checks supplies received, issued, or shipped, and reports discrepancies noted in quantity, quality, or physical condition. He keeps the company property books and is responsible for the general condition of the company supply room.
- (2) *The engineer supply specialist* helps the supply sergeant in the execution of his duties and performs such duties as directed by the supply sergeant. He particularly supervises, or assists in, the procurement, receipt, storage, and issue of engineer supplies and equipment. He must be qualified to replace the supply sergeant.

- (3) *The armorer* maintains, services, and makes minor repairs on the ordnance weapons of the company. He sends all weapons requiring major repairs to the battalion supply section for repair by appropriate ordnance shops. He also fires the .50-caliber machine gun.
- (4) *The truck driver* performs duties as shown in paragraph 19. He also performs some supply duties such as pick-up and delivery of supplies.

c. Employment and Operations. The supply section handles the procurement of supplies needed by the company. Normally, the company supply section deals directly with the battalion supply section in procuring the supplies, and then reissues such supplies directly to the using company unit or individual. However, rations, expendable motor vehicle supplies, and petroleum products are issued directly by the S4 to the mess section and equipment and maintenance section respectively.

d. Training. The training of the supply section in general and basic subjects is given with the provisional headquarters platoon. See paragraph 68. A supply sergeant is provided in the cadre and trains the supply specialist. The battalion S4 may organize schools on a battalion level to improve and supervise the technical training of the supply sergeant and specialist. The driver may be trained in a battalion driver's school. The armorer is preferably trained in an ordnance armorer's school of the division or service.

57. EQUIPMENT AND MAINTENANCE SECTION

a. Organization. The equipment and maintenance section consists of a motor sergeant, wheeled-vehicle and construction-equipment mechanics, a mechanic's helper, electrician, heavy-truck driver, and dozer and air-compressor operators.

b. Duties of Equipment and Maintenance Personnel.

- (1) *The motor sergeant* supervises the work of the equipment and maintenance section. He inspects the performance of preventive and organizational maintenance and helps the mechanics when necessary. He keeps maintenance rosters on all company vehicles and equipment, and maintains records on the use and care of supplies in the motor pools. He supervises the dispatch of vehicles.
- (2) *The mechanics* perform organizational inspections, maintenance, and repair on the automotive and construction equipment of the company as directed by the motor sergeant. They also help the motor sergeant during inspections and organizational preventive maintenance services. One of the wheeled-vehicle mechanics operates and maintains the section's $\frac{3}{4}$ -ton truck.
- (3) *The electrician* can install interior wiring in small buildings erected by the company, or can make minor repairs to wiring in captured structures being utilized. When not so engaged he assists the mechanics in maintenance of vehicles and equipment.

- (4) *The heavy-truck driver* is responsible for the operation of the 6-ton truck tractor and the 20-ton trailer which normally carries the angledozer. At other times, the truck and trailer may be used to carry other heavy and bulky loads. When his vehicle is idle, the driver may help in other motor park operations as required by the motor sergeant.
- (5) *The two dozer operators* are provided for double-shift operations. They operate and maintain the company angledozer.
- (6) *The air-compressor operators* maintain and operate the air compressor and supervise the operation of the accompanying pneumatic equipment. They maintain and may operate the pneumatic equipment. One of the operators drives the air-compressor truck.

c. Employment and Operations. The equipment and maintenance section performs organizational maintenance on all vehicles and mechanical engineer equipment of the company. It also furnishes a small equipment pool, composed of the dozer and air compressor, for use by the platoons as assigned by the company commander. Preventive maintenance on vehicles and equipment of the section is performed by the responsible operator.

d. Training.

- (1) The training of the equipment and maintenance section in general and basic subjects is given with the provisional headquarters platoon. See paragraph 66.
- (2) Members of the equipment and maintenance section are given specialist training in a bat-

talion school, in a service school, or by on-the-job training.

- (3) A motor sergeant, wheeled-vehicle mechanic, and a dozer operator are provided in the cadre to assist in training. See FM 25-10.

Section XV. COMPANY EMPLOYMENT AND PIONEERING OPERATIONS

58. COMPANY EMPLOYMENT

a. The engineer combat companies are normally employed in support of the infantry regiments, but remain under control of the division engineer to insure flexibility of effort. A typical assignment is for companies A, B, and C to be placed in direct support of the 1st, 2d, and 3d infantry regiments, respectively, with company D held back in general support, executing engineer missions in the division area, but always prepared to assist or relieve any of the forward companies.

b. Each company may be given area assignments or, infrequently, task assignments. Area assignments in turn are normally broken down into platoon tasks. In a task assignment, such as the construction of a fixed or floating bridge within the divisional area, the company may work as a unit. The company may also be employed as part of the battalion; for example, when the battalion is committed as infantry.

c. The company can operate independent of the battalion, when attached to another unit. The company may be attached when centralized control by

the battalion is difficult. This condition exists during pursuit and during isolated operations such as those given separate combat team task forces.

d. Many assignments will necessitate staggered work hours, continuous operation in shifts, or even extended periods of operation without relief. The company commander must balance the effects of fatigue on his men and lack of servicing his equipment against the urgencies of the situation.

59. PIONEERING

a. *Construction.* The company, as a unit, performs the same type of construction tasks as the platoons. Because of the supervision and coordination provided by company headquarters, it can accomplish much larger missions. The company, when reinforced with additional heavy equipment, is able to perform heavy construction tasks. Although the company has no organic bridging material, it can construct timber (fig. 15), pontoon, and panel bridges when the necessary materials and equipment are available. It can also construct small buildings and can build and maintain hasty, expedient, and surfaced roads. Company projects also include laying mine fields and constructing all types of obstacles.

b. *Destruction.* Normally, the company commander plans destructive works in accordance with specifications from the battalion commander. The platoons then execute the plans under supervision of company headquarters (pars. 20 and 38). Items to be destroyed include buildings, bridges, culverts, water works, power stations, abandoned airplanes

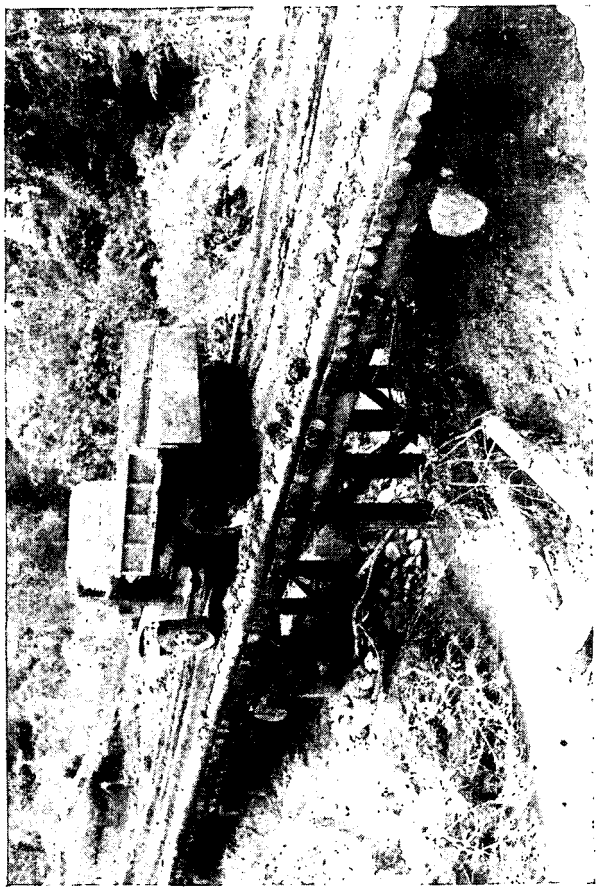


Figure 15. Small timber bridge, built from native materials in New Guinea.

and supplies, railroad facilities, disabled vehicles, and obstacles of all types.

c. Reconnaissance. The company commander directs general engineer reconnaissance continually, and as specified by the battalion commander. Reconnaissance patrols are operated for the battalion or the supported infantry regiment, as required. Frequently, special reconnaissance is made to secure detailed information on a specific subject or for a special purpose. The company rarely executes reconnaissance missions as a unit. Patrols are usually composed of platoons, squads, or selected groups of men under company officers, depending on the mission at hand (fig. 16).

Section XVI. COMPANY COMBAT OPERATIONS

60. THE ADVANCE AND ATTACK

In the advance and attack, the general mission of the company is to facilitate the forward movement of the attacking force. Normal engineer tasks include—

- a.* Performing engineer reconnaissance.
- b.* Repairing and maintaining roads and trails.
- c.* Repairing, strengthening, and maintaining bridges.
- d.* Constructing bridges and bypasses.
- e.* Removing, neutralizing, or destroying all types of man-made and natural obstacles to the forward movement (fig. 17).
- f.* Assisting the flank security by constructing obstacles in likely avenues of enemy attack.



Figure 16. Reconnaissance team crossing the Our River in Luxembourg. Note rope to facilitate an emergency withdrawal.



Figure 17. Engineers prepare to breach antitank wall in southern France, using TNT and Tellermine.

g. Assisting in the organization of captured ground.

h. Assisting in providing engineer supplies, especially water and maps.

61. THE DEFENSE

In the defense, the company is normally retained under control of the division engineer and is given area or task assignments. Normal engineer tasks include:

a. Performing engineer reconnaissance.

b. Repairing, maintaining, or constructing roads and trails.

c. Constructing shelters, command posts, observation posts, and special field works.

d. Providing technical assistance to other troops in preparing defensive positions, including barbed wire and weapons emplacements.

e. Providing fortification materials and engineer equipment, if not done by battalion S4.

f. Laying and recording mine fields and constructing other obstacles (fig. 18).

g. Aiding in camouflage and the clearing of fields of fire.

h. Preparing alternate positions and erecting barriers in depth.

i. Participating in combat as infantry.

j. Assisting in flank and rear-area security.

62. RETROGRADE MOVEMENT

During a retrograde movement, the company commander directs the platoons in preparing successive defensive positions and obstacles, in impeding the



Figure 18. Engineers laying mine field.

progress of the enemy, and in aiding the evacuation of friendly troops. The company is normally charged with the destruction of specific bridges (fig. 19) and with the destruction of supplies and equip-



Figure 19. Engineers preparing to destroy a bridge to delay the enemy.

ment which cannot be evacuated. It also aids in flank and rear-area security.

63. RIVER-CROSSING OPERATIONS

In river-crossing operations the company normally operates as part of the battalion (sec. XII, ch. 5).

Among the company's tasks are—

a. Operating boats, rafts, or ferries (fig. 20). See TM 5-271.

b. Removing obstacles, including mines and booby traps, from near and far shores.

c. Constructing or repairing approach roads, abutments, and landing sites.

d. Improving assembly areas.

e. Providing guides for boat groups.

f. Performing engineer reconnaissance.

g. Providing engineer support to infantry units on the far shore.

64. SECURITY

a. The company commander is responsible for security of the company while performing engineer tasks, unless another unit is specifically assigned the mission (fig. 21). On projects forward of the main line of resistance, the supported unit normally furnishes the security for the working party in order to release the engineers for maximum effort on the project.

b. If the company is working closely with, and in the immediate vicinity of, infantry troops, the security is provided by the infantry commander. However, when the company is working, moving (fig. 22), or living alone, the security force must come

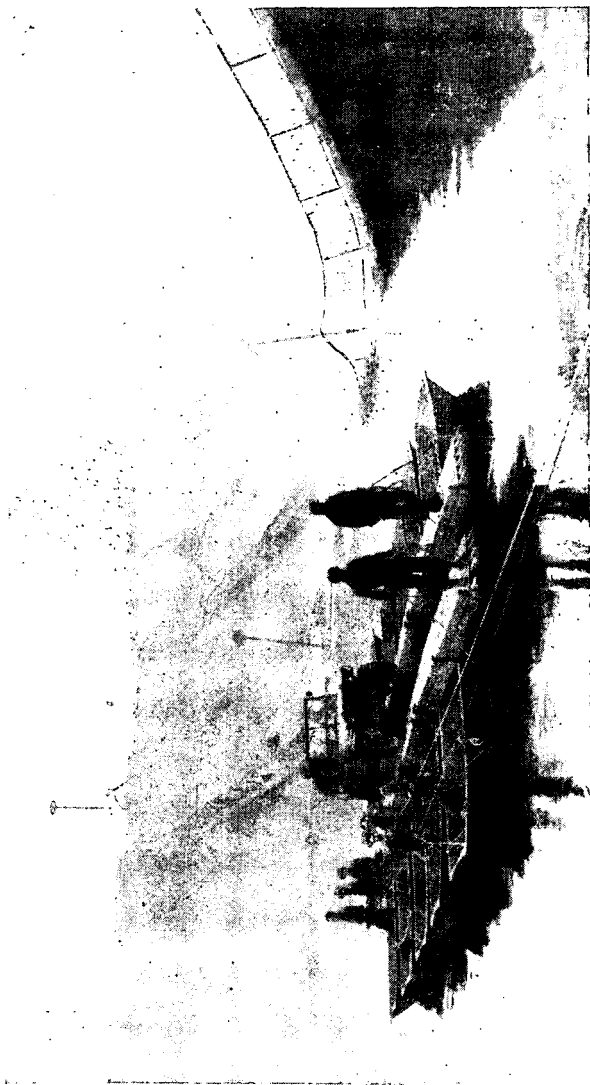


Figure 20. Engineers operating an infantry assault ferry.

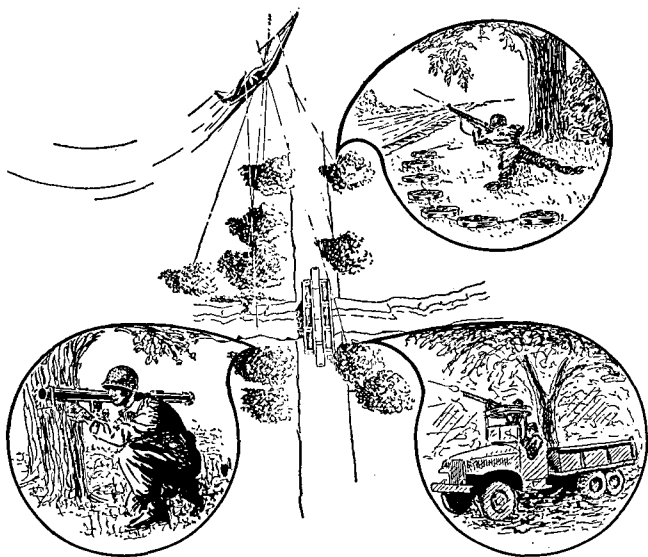


Figure 21. Provide all-around local defense for a working party.

from the company. The size of the security detachment depends on the terrain, the proximity and strength of the enemy, and the probability of attack.

65. INFANTRY COMBAT

Although seldom used as infantry, the company must be well-trained in infantry tactics for two reasons. First, all or part of the company may be attacked while at work and have to fight its way out. Second, when engineers are committed as infantry, the situation is so grave that the success or failure of a whole operation may depend on the engineers' successful assumption of the infantry role. When

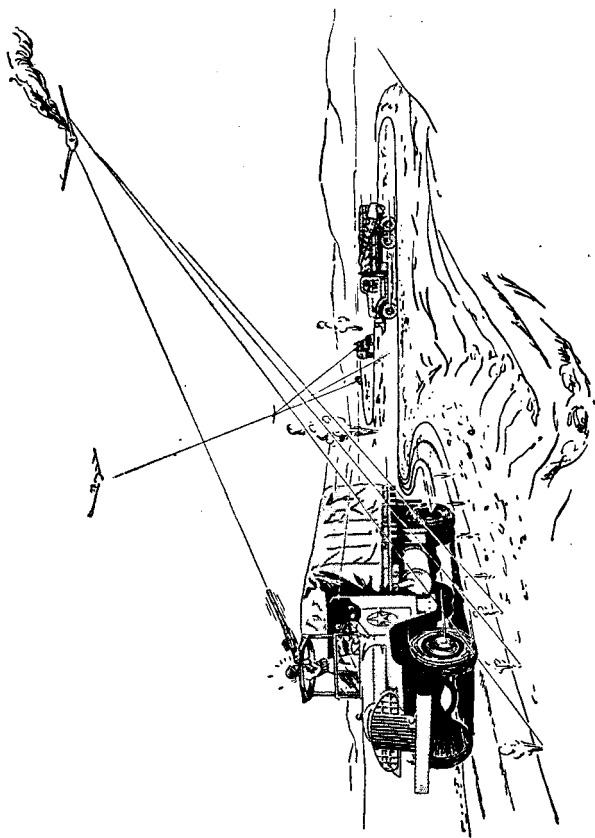


Figure 22. Be alert for air attacks and fire all available weapons.

the company is committed as infantry, it reorganizes to improve its fighting potential. See section XVI, chapter 5, and appendix III of this manual.

Section XVII. COMPANY TRAINING

66. GENERAL

a. Individual training and training of the squads, platoons, and company headquarters sections have been discussed earlier in this chapter. If the personnel of company headquarters have not had basic military and engineer training before joining the company, they are normally grouped as a provisional headquarters platoon under the company executive officer for this training. Since most of the company headquarters personnel must perform operational duties concurrent with training, special care must be taken to arrange appropriate training hours for them.

b. The company commander plans the company training program according to training directives and policies provided by the battalion commander. Proficiency in basic engineering subjects on the part of all the men in the company is stressed. It is more general for platoon commanders to train their own platoons, than for each officer in the company to teach a separate subject to the entire company. Full advantage should be taken of various school quotas for the training of specialists.

c. Company training is of two types. In one type, the whole company works on one project and members of all elements of the company learn to work together as a team. This type of training is practical for such subjects as construction, particularly

bridge construction and infantry combat. In the other type of training, the platoons are working on different tasks and members of the command, mess, supply, equipment and maintenance, and communication sections learn how to support work elements most effectively. This type of company training is practical for all subjects. Both types of training are vital to the successful operation of the company. For further training information, see section II, chapter 5, of this manual.

67. TRAINING OTHER ARMS AND SERVICES

The company is sometimes called on to conduct demonstrations of mine laying or clearing, bridge construction, or other engineer functions for the training of nonengineer troops of the division. Most demonstrations, however, are staged by a platoon or squad (secs. VI and XI above). The company commander furnishes specialists who instruct other troops: The subjects taught include: mine warfare, use of explosives, camouflage, field fortifications, and bridging and roadbuilding expedients. The instructors are usually the company officers or key noncommissioned officers.

CHAPTER 3

HEADQUARTERS AND SERVICE COMPANY

Section I. GENERAL

68. MISSION

The mission of headquarters and service company is threefold. It furnishes enlisted personnel for battalion headquarters, it furnishes all company-level administration and administrative support for battalion headquarters, and it furnishes certain battalion-level service and combat support for the entire battalion.

69. ORGANIZATION

Headquarters and service company consists of the enlisted personnel who work in battalion headquarters, a company headquarters, and three operating platoons. The three platoons are the assault platoon, the bridge platoon, and the equipment and maintenance platoon. The organization, duties, and training of the men comprising the battalion headquarters sections are detailed in chapter 4. The company headquarters (fig. 23) and three platoons are discussed in the following sections of this chapter. Normally, the medical detachment is attached to headquarters and service company for administration to include rations, quarters, supply, maintenance,

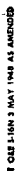


Figure 23. Headquarters and service company, engineer combat battalion, divisional.

personnel matters, and some general military training (sec. XII below).

70. HEADQUARTERS FUNCTION

Headquarters and service company provides the enlisted men for battalion headquarters. These men are assigned to the various sections of battalion headquarters and are under the operational control of the officer heading that section. The company feeds, clothes, houses, and pays these men, and is responsible for their conduct when they are not at their duty section. These men are normally released to the company commander for necessary military training and administrative duties (par. 117), but the concurrence of the section chief is obtained before rosters and schedules are released.

71. SERVICE FUNCTION

The service function of headquarters and service company is direct and tangible. It feeds, clothes, and houses battalion headquarters personnel. It provides transportation and organizational maintenance for battalion headquarters sections. It provides an equipment pool for the battalion as a whole but does not provide battalion-level supply or maintenance, since these functions are performed by the respective sections of battalion headquarters. The company does have a combat support function which is discharged by the assault platoon.

72. EQUIPMENT POOL

Headquarters and service company has two separate equipment pools. In the construction-equip-

ment pool, the equipment is maintained, delivered, and operated by personnel of the equipment and maintenance platoon. This pool consists of several pieces of organic equipment supplemented by other equipment drawn from army engineer depots as required, and is available to any of the combat companies. The other equipment pool consists entirely of bridging equipment and is maintained and transported by the bridge platoon. This equipment is also available to all the combat companies and can be supplemented by equipment from an army engineer depot.

Section 11. ASSAULT PLATOON

73. MISSION

The mission of the assault platoon is to provide armored engineer support to troops where deemed necessary by the battalion commander. Such support may be armored carrier protection or limited equipment operation under fire. Fire support can be given by the platoon in emergencies.

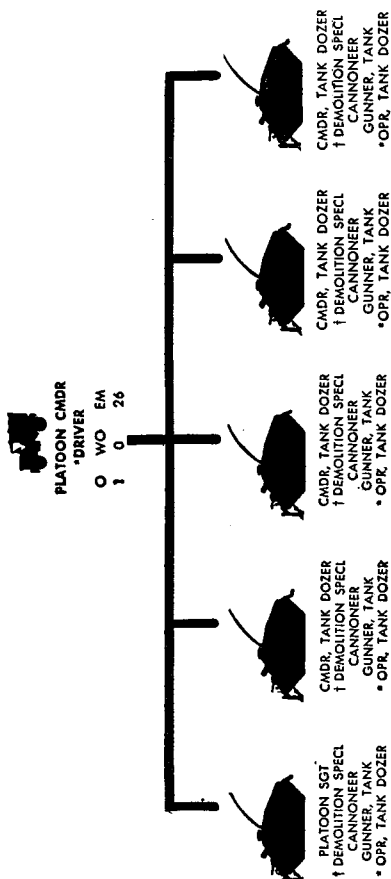
74. ORGANIZATION

The assault platoon consists of a commissioned platoon commander, his truck driver, and five tank dozer teams. The platoon sergeant commands the lead tank dozer. Detailed organization is shown in figure 24.

75. DUTIES OF ASSAULT PLATOON PERSONNEL

a. The platoon commander performs, generally, those duties listed in paragraph 32, applying them to

ASSAULT PLATOON HQ, H&S CO ENGR COMBAT BN (DIV)



- NOTES: 1. † OPERATES RADIO
2. * DRIVES VEHICLE

Figure 24. Assault platoon, engineer combat battalion, divisional.

the tank dozer crews instead of to squads. In addition, he must pay close attention to the maintenance of the tank dozers and their weapons.

b. The platoon sergeant performs generally those duties listed in paragraph 33 applying them to tank dozer crews instead of to the squads. He is not a combat construction foreman. If two or more of the platoon tank dozers are detached from the platoon on a single mission, the platoon sergeant may be used as a detachment commander. He commands a tank dozer in normal operations.

c. The tank dozer commander is responsible for the control and coordination of the crew. He directs the operation of the tank dozer to take advantage of cover and maneuver. He directs the fire of the tank dozer and fires the .50-caliber machine gun or submachine gun as required. He maintains inter-tank-dozers and tank dozer-company communication and supervises the maintenance of the tank dozer, arms, and equipment.

d. The tank dozer gunner fires the tank gun and submachine gun to destroy enemy personnel, equipment, vehicles, obstacles, and other targets.

e. The cannoneer loads the tank, assists in operating the tank radio and performs other duties as directed by the tank dozer commander.

f. The tank dozer operator is responsible for the operation of the tank dozer and dozer blade and performs preventive echelon maintenance. He can fire the .30-caliber machine gun or a submachine gun as required.

g. The demolition specialist is the assistant tank dozer operator and with the dual controls is able to

take over the operation of the tank dozer and dozer blades at any time. He performs demolitions as directed. When necessary, he fires the .30-caliber machine gun or a submachine gun.

h. The truck driver drives the $\frac{3}{4}$ -ton truck for the platoon commander and performs duties as shown in paragraph 18.

76. ASSAULT PLATOON EMPLOYMENT

The assault platoon is employed in support of other combat units in the battalion. Tank dozers are normally attached singly or in pairs to the combat companies for a specific engineer mission. However, they may be employed as a complete platoon or any part thereof. Normally the battalion S3 recommends to the battalion commander attachment of all or part of the assault platoon to companies to give armored support to battalion operations.

77. PIONEERING

a. The tank dozers of the assault platoon can clear wrecked vehicles and debris from roads and streets, aid in removal of antitank and other obstacles, fill in shell holes and ditches, and do all normal rough dozer operations in connection with roads, fords, bridges, and the like. A tank dozer cannot, however, be expected to do the same amount or quality of work as that done by a heavy crawler tractor. When operating under small arms fire, with the tank dozer buttoned up, the operator cannot work effectively within close limits. In this case the commander of a pilot tank, off to one side and in radio communication with the operating tank, must help

orient the commander of the operating tank and give him needed information.

b. In its capacity as an armored equipment and personnel carrier, the tank dozer aids in hasty demolitions. This function may be conducted from within the tank or by personnel outside the tank who are protected by it.

78. TRAINING

General training of personnel of the assault platoon is provided by the company commander of headquarters and service company. A platoon sergeant and tank dozer commander are provided in the cadre to assist in training. In addition to general training, the members of each tank dozer crew must be given thorough training in their specialties and possible alternate assignments. Smooth coordination and functioning by the tank dozer crews must be emphasized in combined operations of foot and mechanized units. Primary training emphasis is placed on operation of the tank dozer as a valuable item of engineer heavy equipment. Secondary emphasis is given to its use as a tank in combat.

Section III. ASSAULT PLATOON COMBAT OPERATIONS

79. THE ADVANCE AND ATTACK

In the advance and attack the assault platoon or a portion of the assault platoon performs such missions as will facilitate the advance of the supported unit. These missions may include:

a. Improvement and clearing of roads and streets (fig. 25).



Figure 25. Engineers using a tank dozer to build a road.

b. Destruction and removal of obstacles other than mines. However, the demolition snake or similar mine clearing device may be used.

c. Destruction of pillboxes and other enemy defenses.

d. Improvement and construction of bridge approaches and fords.

e. Delivery of limited support fire in emergencies.

80. THE DEFENSE

The assault platoon in the defense aids in the construction of defense areas and in the active defense of such areas. Its tasks include:

a. Dozer work such as clearing fields of fire, filling craters, excavating, and rough grading.

b. Provision of armored carriers for the transportation of ammunition, explosives, or demolition personnel.

c. Defense of obstacles or other antimechanized defense when required.

81. RETROGRADE MOVEMENTS

During retrograde movements the assault platoon performs tasks which facilitate the movement of friendly troops, hinder the movement of the enemy, and deny the enemy valuable facilities. Such tasks may be performed by dozer work, destruction by demolitions, or fire in defense of obstacles and barriers.

82. RIVER-CROSSING OPERATIONS

In a river-crossing operation the assault platoon can help in—

a. Bypassing obstacles and destroying enemy defenses on both near and far banks.

b. Constructing or repairing approach roads, abutments, and landing sites.

c. Improving attack positions and initial assembly areas.

83. ASSAULT OF FORTIFIED POSITIONS

The assault platoon can be used to great advantage in an assault of a fortified position because of its armor protection, fire power, mobility under fire, and special accessories. The platoon can help in the following tasks:

a. Destruction and removal of obstacles by—

(1) Direct fire.

(2) Placing of demolitions and removal of mines by hand.

(3) Use of a demolition snake or similar mine-clearing device.

(4) Mechanical breaching with the dozer blade.

(5) Blinding pillboxes by pushing earth over their embrasures.

b. Surmounting or bridging of obstacles by—

(1) Filling craters and ditches.

(2) Laying mat over heavy wire entanglements, or crushing or pulling out light wire entanglements.

c. Rapid construction and maintenance of routes into and through the gap in the fortified position.

84. SECURITY

When security is not furnished by the supported unit, the assault platoon commander must set up his

own local security. The platoon commander employs such measures as concealment, defilade, cover, and a system of outposts. If no infantry or engineer foot troops are teamed with the tank dozers, at least one crew member per dozer is dismounted to serve as sentinel and observer.

85. INFANTRY COMBAT

See appendix III.

Section IV. BRIDGE PLATOON

86. MISSION

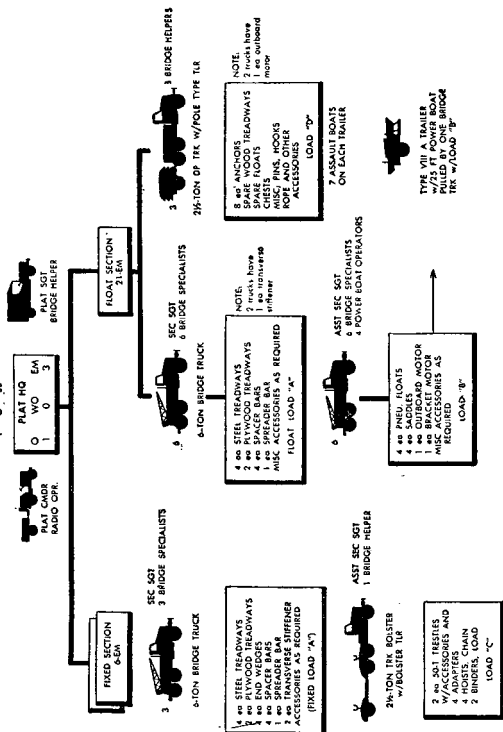
The mission of the bridge platoon is to furnish, on short notice, bridge equipment and technical assistance in its construction which will enable divisional units to cross creeks, narrow rivers, gorges, and ravines with minimum delay. The bridging equipment is especially suitable for hasty or short-gap bridging, as well as for floating bridging. Equipment for deliberate river crossings and for more permanent bridges is supplied by corps and army engineer units, since the division may need the bridge platoon in its operations on the far side of the river. The vehicular loading plan of the bridge platoon readily permits attachment of appropriate loads of bridge sections to combat companies.

87. ORGANIZATION

The bridge platoon consists of two fixed sections, a float section, and a platoon headquarters. It is organized this way to permit efficient transportation and use of the treadway, widened, steel, floating

BRIDGE PLATOON

Q WO EM
1 O . 35



NOTE: NUMBERS IN FRONT OF VEHICLES REPRESENT NUMBER OF SUCH VEHICLE PER SECTION. NO NUMBER INDICATES ONE.
EQUIPMENT IN LOADS INCOMPLETE. MAJOR ITEMS FINAL. CHANGE LOADS TO MEET CHANGES IN BRIDGE SET.

Figure 26. Bridge platoon, engineer combat battalions, divisional.

bridge. Organization and vehicles are shown in figure 26.

Section V. FIXED SECTIONS

88. ORGANIZATION

Each fixed bridge section consists of a section sergeant, an assistant section sergeant, bridge specialists, and one bridge helper.

89. DUTIES OF FIXED SECTION PERSONNEL

a. The section sergeant is responsible for the discipline, control, and conduct of the section. He may operate a hand-carried voice radio borrowed from platoon headquarters, fire the .50-caliber machine gun, or fire the rocket launcher. He directs and supervises the maintenance, security, training, and operational activities of his section. He provides technical assistance to the combat companies in the loading, unloading, construction, maintenance, and dismantling of the bridge.

b. The assistant section sergeant performs duties as assigned by the section sergeant and commands the section in the absence of the latter. He may operate a hand-carried voice radio, fire the .50-caliber machine gun, or fire the rocket launcher. He provides technical assistance in loading, unloading, construction, maintenance, and dismantling of the bridge.

c. The bridge specialists and bridge helper are heavy- and light-truck drivers, respectively. They assist and supervise the loading and unloading of their trucks. They are qualified to supervise and assist in construction or dismantling of the bridge. They are trained in both day and night convoy opera-

tions and perform driver duties as given in paragraph 18.

90. EMPLOYMENT

The fixed bridge section, with a complete 24-foot bridge carried on each 6-ton bridge truck, can support another unit as a section, as any part of the section, or as part of the bridge platoon, depending on the type and length of bridge required at the site.

91. OPERATIONS

a. River-crossing Operations. Each fixed section has sufficient bridging equipment to erect up to one 70-foot-span fixed bridge. The equipment of both fixed sections, using the four 50-ton trestles, can be combined to erect up to one 142-foot-span, fixed bridge. Both of these maximum-length bridges can support the division load. For crossing deep or wider rivers, the equipment of the two fixed sections is used with that of the float section to construct a floating bridge or rafts.

b. Short-span bridging. The equipment of each fixed section is especially adapted to short-span bridging. The equipment (load "A," fig. 26) carried on the three 6-ton bridge trucks is sufficient to build fixed bridges of two 34-foot spans, three 22-foot spans, or six 10-foot spans. See tables III and IV for clear spans and capacities. One 6-ton bridge truck with load "A" or an entire fixed section, plus a truck-mounted crane, can be attached to an engineer combat unit to provide bridging equipment for short gaps, as required.

Table III. Capacity for Treadways Unsupported Over Short Gaps

Number of treadways in span	Over-all length of span	Clear span (feet)	Capacity in tons		
			Type of crossing		
			Safe	Caution	Risk
2 treadways ¹		20	91	110	140
	24 ft	² 22	79	94	120
3 treadways		24	69	80	103
		26	50	69	92
		28	53	61	82
		30	48	54	73
		32	44	49	65
	36 ft	² 34	40	45	57
4 treadways ³		36	30	34	50
		38	27	31	46
		40	25	28	43
		42	23	26	40
		44	21	24	37
	48 ft	² 46	20	23	34
5 treadway ³		48	19	22	31
		50	18	21	30
		52	18	20	28
		54	17	19	27
		56	16	18	25
	60 ft	² 58	16	18	24
Plywood treadway lane -----		up to 34	16	18	24

¹ For capacities of 2-treadway span bridges without transverse stiffeners decrease capacities by 20 percent.

² Maximum length gap which can be bridged with a single-span treadway is 2 feet less than the over-all bridge length, to allow a minimum bearing length of 1 foot at each abutment.

³ For bridges longer than 36 feet, normally the plywood treadway is omitted and the bridge width is reduced to the narrow type of erection as shown in FM 5-35.

Table IV. Maximum Number of Bridges (Minimum Capacity 50 Tons), Maximum Lengths, Built with the Bridge Set, Floating, Steel, Treadway, Widened

Unit	Type of bridge	Length of clear span in feet							
		10	22	34	46	70	142	178	286
Fixed section (Two per platoon) --	Short fixed -----	6	3	^a 2					
	Long fixed with: 1 trestle ^b -----			2	1	^a 1			
	2 trestles ^b -----			2	1	1			
Float section (One per platoon) --	Short fixed -----	12	6	^a 4					
	Floating -----		6	4	3	2	1		
Platoon -----	Short fixed -----	24	12	^a 8					
	Long fixed ^c with: 1 trestle ^b -----			4	4	^a 4			
	4 trestles ^b -----				2	2	^a 1	^a 1	
	Floating ^d -----		12	8	6	4	2	1	1

^a Capacity: normal, 40 tons; caution, 45 tons; risk, 57 tons.

^b Very desirable to place trestles under treadway joints to accommodate trestle settlement and prevent treadway twist.

^c Additional short fixed bridges can be built from remaining parts.

^d Four 50-ton, 6-float rafts can be built instead of floating bridge.

c. Security. The weapons of the fixed section provide some protection against foot troops, and against air and mechanized attacks. Since the weapons and men are few, particular care must be taken to use cover, concealment, and camouflage techniques. When the section, or any part thereof, is attached to a combat unit, the security plan of the combat unit includes protection of the fixed bridge section.

Section VI. FLOAT SECTION

92. ORGANIZATION

The float section consists of a section sergeant, an assistant section sergeant, bridge specialists, bridge helpers, and powerboat operators.

93. DUTIES OF PERSONNEL

The section sergeant, assistant section sergeant, bridge specialists, and bridge helpers have generally the same type of duties as those in the fixed sections (par. 89). The powerboat operators maintain and operate the outboard motors and instruct other personnel in their operation. One of the operators maintains and operates the 25-foot powerboat (fig. 27).

94. EMPLOYMENT

The float section may be attached, as a whole or in part, to a combat unit with a bridging or rafting mission. The number of trucks and types of loads attached to another unit depends on the number and length of fixed bridges, length of floating bridge, or number and size of rafts required.

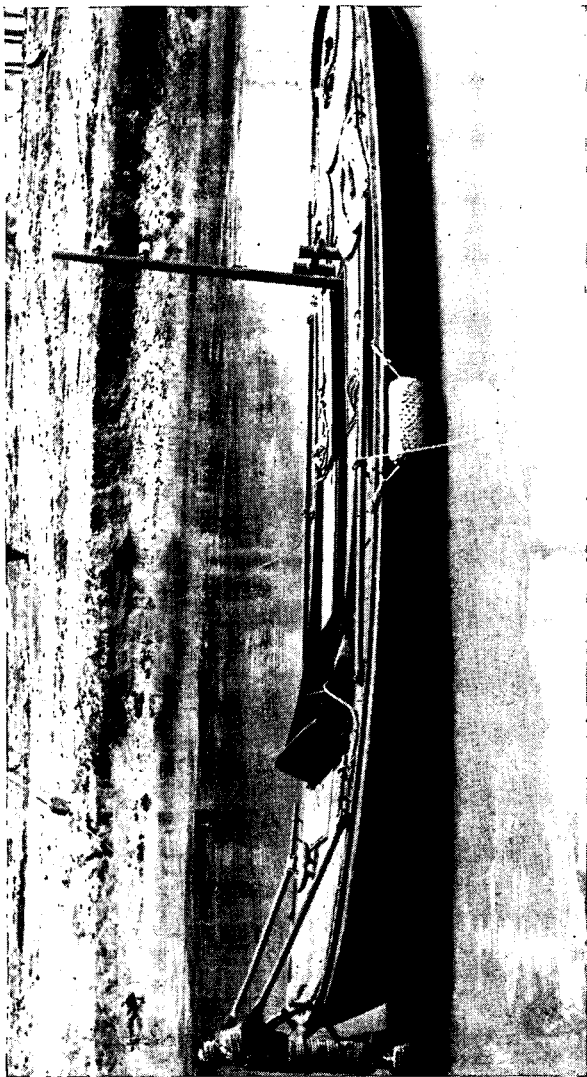


Figure 27. Utility powerboat, 25-foot.

95. OPERATIONS

a. River-crossing Operations. The section equipment is used primarily for floating bridges and rafting and for crossing troops in a hasty river crossing. The maximum length of floating bridge which can be constructed within the float section is 144 feet. Combined with the bridging equipment of the two fixed sections, 288 feet of floating bridge may be erected. Assault boats and the 25-foot powerboat are available as required. Outboard motors are provided for propelling rafts and double or single assault boats, or for aiding in the construction of the floating bridge.

b. Security. Security of the float section follows, generally, that of a fixed section (par. 91).

Section VII. PLATOON HEADQUARTERS

96. MISSION

The platoon headquarters of the bridge platoon provides a command channel from battalion and company headquarters to the platoon. The platoon commander plans and supervises the operations of the fixed and floating sections.

97. ORGANIZATION

The platoon headquarters consists of the platoon commander, platoon sergeant, bridge helper, and radio operator.

98. DUTIES OF PERSONNEL

a. The platoon commander performs, generally, those duties listed in paragraph 32, applying them

to sections rather than to squads. In addition, he is responsible for maintenance and transportation of the bridge. He may provide technical assistance in the construction of the bridge, or he may direct and supervise its construction or dismantling.

b. The platoon sergeant performs, generally, those duties listed in paragraph 33 for a combat company platoon sergeant except those pertaining to general construction. He may also provide technical assistance in construction and dismantling of the bridge.

c. The radio operator drives the $\frac{1}{4}$ -ton truck. He operates, maintains, and makes minor repairs to the radio and converter mounted in the $\frac{1}{4}$ -ton truck.

d. The bridge helper drives the $\frac{3}{4}$ -ton truck and may assist in bridging tasks as directed.

Section VIII. PLATOON OPERATIONS AND TRAINING

99. BRIDGE PLATOON EMPLOYMENT

The bridge platoon is employed as a whole, in sections, in parts of sections, or by any combination of these in support of combat units as described for employment of the fixed section and the float section. The platoon or elements of the platoon are attached to the combat companies for specific missions by the battalion commander upon recommendation by the battalion S3. The bridging equipment must not be wasted on nonessential bridging or where other means are available. When used, organic bridging is picked up again at the earliest opportunity for reemployment on forward bridging tasks.

100. OPERATIONS

See paragraphs 91, 94, and 95.

101. TRAINING

a. The training of the bridge platoon is coordinated with headquarters and service company commander for general training. Training in the use of platoon bridge and boat equipment is done on a platoon basis. Each bridge specialist and helper is trained to give technical assistance in the portion of bridge carried on his truck. Special training is given the motorboat operators in the operation and handling of the outboard motors and assault boats so they, in turn, can instruct other troops. Emphasis must be placed on having all personnel acquire a thorough knowledge of the care, maintenance, employment, loading, unloading, construction, dismantling, transportation, and characteristics of the bridge. In addition, all platoon personnel should become familiar with the operation and handling of the outboard motors and assault boats. They should also know the characteristics, capabilities, and operational techniques of all platoon weapons. The use of dispersion, cover, and concealment as security measures must be emphasized.

b. Combined training with the combat companies must be emphasized since the bridge platoon normally transports the bridge and boat equipment to the bridge or crossing site, and then turns it over to a component of the engineer battalion. The latter erects and operates the equipment, with technical assistance from personnel of the bridge platoon.

c. A platoon sergeant and three section sergeants are provided in the cadre to assist in training.

Section IX. EQUIPMENT AND MAINTENANCE PLATOON

102. MISSION

The equipment and maintenance platoon contains engineer construction equipment and equipment operators to supplement those of the combat companies. In addition, the platoon performs organizational maintenance on vehicles for battalion headquarters, headquarters and service company and the medical detachment.

103. ORGANIZATION

The platoon consists of a platoon leader, a motor sergeant, construction-machinery foreman, mechanics, mechanics helpers, truck drivers, and grader, air compressor, crane, and tractor operators. Each item of construction equipment in the platoon has two operators, making double-shift operation possible. Detailed organization and equipment are shown in figure 28.

104. DUTIES OF EQUIPMENT AND MAINTENANCE PLATOON PERSONNEL

a. *The platoon leader* supervises the equipment and maintenance platoon. He is responsible for its discipline, training, and manner of performance of work. His duties include:

- (1) Directing and supervising company maintenance, repair, and inspections of the

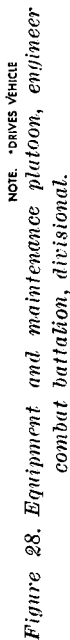


Figure 28. Equipment and maintenance platoon, engineer combat battalion, divisional.

- vehicles and construction equipment of headquarters and service company, battalion staff sections, and the medical detachment.
- (2) Setting up maintenance schedules on vehicles and equipment in accordance with existing directives.
 - (3) Checking incoming repair work to determine the amount and nature of repairs. The equipment and maintenance platoon should not attempt repair work which is the responsibility of a higher echelon.
 - (4) Inspecting shop operations to insure that repair schedules are maintained and that correct methods are being used.
 - (5) Directing and supervising the dispatch and use of platoon transportation and construction equipment.
 - (6) Assisting the battalion commander and his staff in planning and directing the employment of platoon equipment.
 - (7) Providing technical assistance to the supported unit in the use and capabilities of the equipment.
 - (8) Organizing and conducting schools for the training of personnel in operation, preventive and organizational maintenance of engineer equipment and automotive vehicles.

b. The Motor sergeant is second in command of the platoon. He helps the platoon leader in his duties and commands the platoon in his absence. His primary responsibility is supervision of the operation of the company shop and the dispatch of company

motor vehicles. He submits necessary reports and obtains supplies for the operation of the platoon.

c. The construction-machinery foreman helps the platoon leader with the control, supervision, training, dispatch, and employment of the construction equipment section of the platoon.

d. The truck drivers perform duties as shown in paragraph 18. The heavy-truck drivers operate the 6-ton trucks which transport the dozers. The light-truck drivers operate the $\frac{1}{4}$ - and $\frac{3}{4}$ -ton trucks.

e. The mechanics include wheeled-vehicle mechanics, engineer-equipment mechanics, tracked-vehicle mechanics, and mechanic helpers. Each performs inspections, repair, and organizational maintenance as directed on his respective type of vehicle or equipment. One of the wheeled-vehicle mechanics drives the $2\frac{1}{2}$ -ton dump truck.

f. The equipment operators, two per piece of construction equipment in the platoon, operate and perform preventive maintenance on their respective pieces of equipment. The supported unit provides additional operators for each piece of equipment that is to be used for more than two-shift operations.

105. EMPLOYMENT

a. Employment of the equipment and maintenance platoon is entirely separate from that of the battalion maintenance section. No pooling of talent and tools should be permitted. The drivers and operators perform preventive maintenance and help the mechanics with organizational maintenance. The mechanics perform organizational maintenance on all vehicles in headquarters and service company

and those assigned to battalion headquarters staff sections. Platoon employment parallels that of the equipment and maintenance section of the combat companies.

b. The mechanics work primarily within the motor pool, but may be required individually to perform emergency road service.

c. During combat, a roving maintenance team is formed to contact each piece of equipment working with the combat companies every 2 days, or more often if required.

d. The construction equipment is employed in support of the combat companies of the battalion. The equipment pool may work as a unit, but individual operations are more common (fig. 29).

106. OPERATIONS

a. Equipment Pool.

- (1) The construction equipment of the equipment and maintenance platoon is used by the combat company commanders to supplement their own construction equipment when necessary. Separate pieces of equipment, with operators, are allotted by the battalion commander for specific purposes on the recommendation of the S3, and upon completion of the project are returned to headquarters and service company for inspection, maintenance, and reassignment (fig. 30). The company commander of headquarters and service company is responsible for training the operators and maintaining the equipment. The unit commander using the equipment has opera-

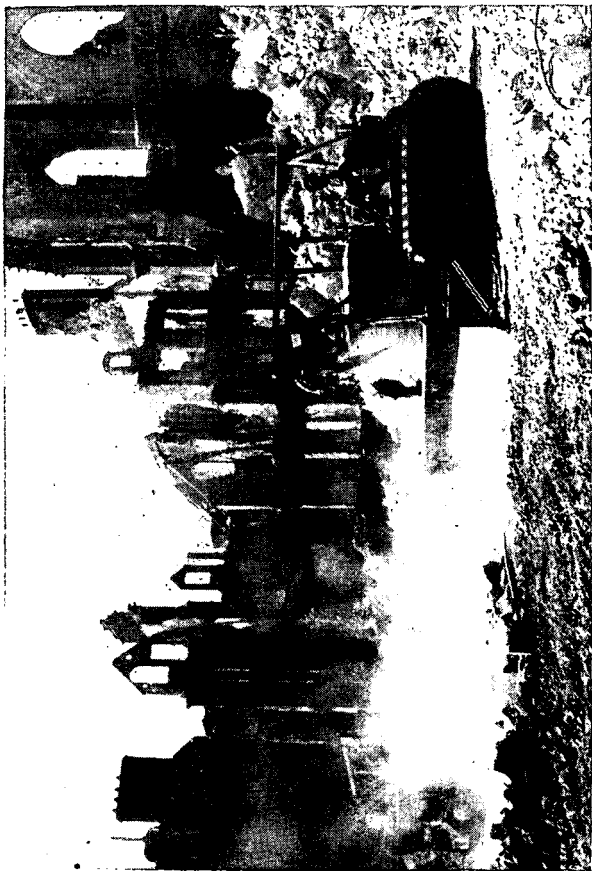


Figure 29. Dozers clearing debris from streets in France.



Figure 30. Motorized grader working on a roadway in Guadalcanal.

tional control over it. Qualified personnel of the equipment and maintenance platoon give technical assistance to the using company, to prevent abuse of the equipment and to provide information on its use, capability, operation, and employment.

- (2) The equipment pool can operate as an independent platoon directly under the battalion S3, other staff officers, or company executive officer, since it has the supervisory personnel necessary. In this case the platoon may be supplemented by equipment, such as dump trucks, from combat companies or the battalion supply section.
- (3) As an example, the battalion might be called on to perform maintenance on a heavily traveled road. The job might involve operating a quarry, hauling the gravel, and grading the road. This would require much equipment but few men. The equipment and maintenance platoon, supplemented by necessary personnel and equipment from other elements of the battalion, would fulfill this requirement.
- (4) The equipment is adequate for most heavy engineer construction work encountered in the construction, maintenance, and repair of routes of communications. See FM 5-10 and TM 5-252.

b. Maintenance. Preventive maintenance on the construction equipment of the equipment pool is done by the equipment operators. Company maintenance on all headquarters and service company and

medical detachment vehicles and construction equipment is done by the mechanics of the equipment and maintenance platoon under the supervision of the motor sergeant, construction-machinery foreman, and platoon leader.

c. Security. The weapons in the equipment and maintenance platoon provide limited protection against foot troops and air and mechanized attacks. However, the primary means of security is careful use of cover, concealment, and camouflage techniques. When the platoon or any part thereof is attached to combat units, the security plan of the combat unit includes protection of the attached unit. During infantry combat the platoon is placed with the rear echelon with some of its personnel used as wire crews, litter bearers, or replacements.

107. TRAINING

a. General training of equipment and maintenance platoon personnel is coordinated with the headquarters and service company commander.

b. Specialist training of equipment operators is given in a platoon school or in a battalion heavy equipment school supervised by the platoon leader of the equipment and maintenance platoon. All operators must be thoroughly trained in the operation, care, use, and capability of their own pieces of equipment. Full advantage must be taken of service school quotas.

c. Specialist training of the mechanics is given by battalion, division, or service school, or by on-the-job training (par. 151). Particular attention should be given to the selection of men as mechanics whose

qualification cards indicate adequate previous experience.

d. A construction-machinery foreman, mechanics, and mechanic's helpers are provided in the cadre to assist in training.

Section X. COMPANY HEADQUARTERS

108. MISSION

The mission of company headquarters is to provide administrative services for headquarters and service company and battalion headquarters. These services pertain, in the broad sense, to all of the requirements of the personnel, including mess, supply, quarters, supervision of non-duty-hour activities, and administrative records.

109. ORGANIZATION

Company headquarters is organized into command and administrative echelons. The administrative echelon contains the unit administrator, company clerk, and mess and supply sections, but no motor section because the equipment and maintenance platoon performs this function. Detailed organization is shown in figure 31.

Section XI. COMMAND ECHELON

110. ORGANIZATION

The command echelon consists of the company commander, executive officer, first sergeant, radio operator, bugler, orderlies, and fillers (fig. 31).

111. DUTIES OF COMMAND ECHELON PERSONNEL

a. *The company commander* has basically the same administrative duties as the combat company com-

COMPANY HEADQUARTERS

O WO EM
2 1 33





COMMAND ECHELON <u>1/</u>		ADMINISTRATIVE ECHELON <u>2/</u>	
ADMINISTRATIVE SEC		MESS SEC	SUPPLY SEC
 1/4 TRK w/H&J TIR O WO EM 2 0 17	 3/4-J TRK O WO EM 0 1 1	 3 1/2-T TRK CARGO w/WATER TIR O WO EM 0 0 14	 3 1/2-T TRK DUMP w/J&J CARGO TIR O WO EM 0 0 4
CO COMMANDER 1	UNIT ADMINISTRATOR 1	MESS SERGEANT 1	SUPPLY SERGEANT 1
EXECUTIVE OFF 1	COMPANY CLERK 1	1ST COOKS 4	SUPPLY SPECIALIST 1
1ST SERGEANT 1		2ND COOKS 3	ARMORER 1
RADIO OPERATOR 1		FOOD SERVICE APPRENTICES 1	LIGHT TRUCK DRIVER 1
BUGLER 1		LIGHT TRUCK DRIVER 1	
ORDERLIES 2			
FILLER PERSONNEL 12			

Figure 31. Personnel and vehicles of company headquarters.

mander (par. 50). However, because he loses operational control over the men in battalion headquarters during duty hours, his problems are multiplied. He must maintain close and cordial relations with the heads of the various staff sections to discharge properly his administrative responsibilities to the officers and enlisted men of these sections. In addition, he normally is headquarters commandant for battalion headquarters. As such he—

- (1) Provides for the local security of battalion headquarters.
- (2) Supervises the physical movement of battalion headquarters and furnishes the necessary men and transportation from headquarters and service company.
- (3) Supervises the headquarters mess and the messing of casuals.
- (4) Acts as headquarters billeting officer in coordination with S1.
- (5) Enforces traffic control regulations within battalion headquarters and headquarters and service company areas.
- (6) For battalion motor marches, marks routes and supervises activities of the guides and the advance details.

b. The executive officer has generally the same administrative duties as the executive officer of an engineer combat company. In addition, he maintains cordial relations with the battalion headquarters officers and assists the company commander in his duties as headquarters commandant. He may be used as the project engineer when the

equipment and maintenance platoon is used as a work unit on a special project.

c. The first sergeant has the same duties and qualifications as the first sergeant of a combat company (par. 50), but he has an additional task of administrative control of the enlisted men of battalion headquarters.

d. The radio operator operates the company headquarters radio set in the battalion net. This radio set is mounted in a $\frac{3}{4}$ -ton command weapons carrier which the radio operator drives. This vehicle is used primarily by the executive officer and first sergeant.

e. The bugler drives a $\frac{1}{4}$ -ton truck for the company commander and acts as his messenger, but nevertheless must perform routine training and housekeeping tasks under the first sergeant.

f. An orderly is authorized for the commanding officer of each category I unit. Each orderly performs duties as directed by the commander to whom he is assigned.

g. The fillers are used on work details where needed in fulfilling the company commander's headquarters commandant function, and as understudies and replacements to company headquarters and the operating platoons. When the company participates in a motor march, the fillers ride in designated trucks of the staff sections.

Section XII. ADMINISTRATIVE ECHELON

112. ORGANIZATION

The administrative echelon consists of the unit administrator (warrant officer), the company clerk,

the mess section, and the supply section. It is supervised by the unit administrator (fig. 31②).

113. UNIT ADMINISTRATOR

The warrant officer unit administrator has the same general duties as the unit administrator in an engineer combat company (par. 53), except that he has no transportation responsibilities.

114. COMPANY CLERK

The duties, employment, and training of the company clerk are identical with those of a combat company clerk (par. 54). His principal equipment is a portable typewriter and a field desk. The headquarters and service company clerk is responsible for the same record keeping on the enlisted personnel in the battalion staff sections as that kept on the personnel in company headquarters and the platoons.

115. MESS SECTION

a. Organization. The mess section consists of a mess steward, first cooks, second cooks, a cook's helper, and a driver.

b. Duties of Mess Personnel. The duties of mess personnel in headquarters and service company are similar to those in a combat company (par. 55). During training and rest periods when the battalion is concentrated, the officers mess may include all officers of the battalion, but normally the company officers eat with the companies. When the battalion is operating in two shifts, the mess personnel are divided between these two shifts to provide adequate food for all men regardless of their hours of work. The driver is used in helping to set up the mess and

in routine kitchen police duties when not drawing rations or maintaining his vehicle. He is responsible for maintenance of the 250-gallon water trailer and for keeping it filled with potable water and available at the kitchen. Mess personnel who cannot ride in the mess truck are furnished transportation in the company headquarters supply truck and certain staff section vehicles.

c. Training. The training of the mess section is no particular problem except that the furnishing of a cadre must be anticipated. The cadre consists of the mess steward and cooks. Therefore a newly activated unit must either find, or train on the job, personnel to serve as food service apprentice and a driver. As soon as the section is operating, additional personnel must be brought in from the fillers or volunteers to be trained as cooks. When a cadre is required, a mess steward, several of the regular cooks and trainees can be furnished. Then the mess section can be re-formed without undue difficulty. Full advantage must be taken of quotas for cooks and bakers schools.

116. SUPPLY SECTION

a. Organization. The supply section consists of the supply sergeant, an engineer supply specialist, an armorer, and a driver.

b. Duties of Supply Personnel. The duties of personnel of the supply section of headquarters and service company are similar to those of the corresponding personnel in an engineer combat company (par. 56).

c. Training. The cadre provides a supply sergeant who trains the supply specialists. The armorer

is preferably trained in an ordnance school on division level or higher, since his specialty is the maintenance of ordnance weapons. His effectiveness may also be improved by self-study and on-the-job experience. The battalion S4 may organize schools on the battalion level to improve and supervise the technical training of the supply personnel. General military training of the section is given by the headquarters and service company commander.

Section XIII. COMPANY OPERATIONS AND TRAINING

117. OPERATION

Headquarters and service company does not operate technically or tactically as a unit except, possibly, during extended infantry combat. Administratively, the company feeds, clothes, supplies, quarters, and handles the paperwork for all men in the battalion headquarters and headquarters and service company. The men of the battalion headquarters are usually not available for such company duties as charge of quarters and fatigue details, as these men perform section duties on section rosters. During activation and in peacetime, the section chiefs and the company commander informally arrange their working schedules to permit a portion of the battalion headquarters personnel to participate in military training activities each day. Such general engineering or infantry combat operations as the company may be called upon to perform are done by appropriate platoons of the company; that is, the assault platoon, the bridge platoon, or the equipment and maintenance

platoon. For participation in combat as infantry, see section XVI, chapter 5, and appendix III.

118. TRAINING

The training of company headquarters personnel is covered in this chapter; battalion headquarters personnel, in chapter 4; and general training policies in chapter 5.

CHAPTER 4

BATTALION HEADQUARTERS

Section I. GENERAL

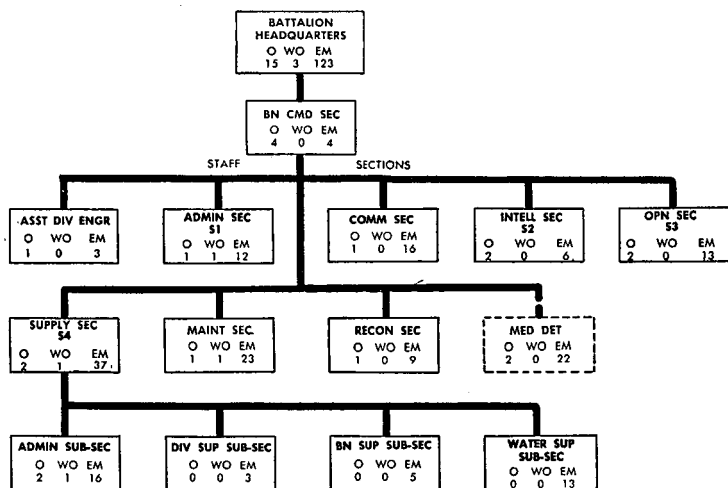
119. MISSION

The mission of battalion headquarters is to provide planning, direction, supervision, and maintenance supply, communication, and clerical service to the companies of the battalion.

120. ORGANIZATION

Battalion headquarters consists of a command section and the following staff sections: division engineer (ADE), administrative (S1), intelligence (S2), operations (S3), supply (S4), communication, battalion maintenance, reconnaissance, and chaplain. The organization is detailed in figure 32. Officers are shown in figure 23 and their duties are explained in this chapter as a part of the section in which they work, although they are carried in the battalion headquarters column of the T/O & E. The enlisted men who work in battalion headquarters are also shown in figure 23 and their duties described as a part of a battalion headquarters staff section, even though they are administratively a part of headquarters and service company. Although the medi-

cal detachment is attached to headquarters and service company for administration, it is discussed with battalion headquarters sections. See appendix III for organization and composition of forward and rear command posts.



NOTE: The Chaplain and Enlisted Assistant are carried in the Command Section, but are discussed separately. The Medical Detachment is attached to H & S Co, but operates under Bn Hq and is discussed in this chapter.

Figure 32. Battalion headquarters.

Section II. COMMAND SECTION

121. ORGANIZATION

The command section consists of the battalion commander and his executive officer, a liaison officer, two drivers, and a radio operator. The command section

assists the commanding officer in his duties as battalion commander as distinguished from his duties as division engineer.

122. DUTIES OF BATTALION COMMANDER AND COMMAND SECTION PERSONNEL

a. The engineer battalion commander is also a member of the division commander's staff. His command and staff functions are separate and distinct in that each involves different responsibilities and duties. Generally, his duties consist of implementing the engineer battalion capabilities listed in paragraph 8.

- (1) The command function requires that the battalion commander direct, supervise, and control the activities of all organic and attached engineer troops and their equipment. He prepares plans, policies, and orders. He visits and inspects his troops and activities, and conducts personal reconnaissance.
- (2) The staff function requires the battalion commander to serve on the division special staff as division engineer. As such he furnishes engineering advice, information, and assistance to the division commander and staff. He helps prepare division plans, policies, and orders. He determines requirements of engineer supplies for non-engineer units of the division and maintains close contact with the division general staff sections, particularly G3 and G4. He keeps informed on engineer phases of plans of

the other special staff officers and keeps them informed of engineer requirements for their services. He maintains close liaison with the division artillery commander and infantry regimental commanders to anticipate their engineer needs. He makes recommendations for requests for engineer support from corps, when required. He coordinates planning with the corp engineer. The division engineer is not under the command of the corps engineer, but technical channels are normally observed.

- (3) Since the division engineer is charged with both command and staff responsibilities, either of which might occupy his full time, he must adopt a method of operation that will permit him to perform all of his duties properly from two different places. To assist him in his dual role are his executive officer and staff at battalion headquarters and the assistant division engineer (ADE) section at division headquarters. See appendix IV for a guide to dual-role problems.

b. The executive officer is second in command. He is responsible for the work of the staff, and controls and coordinates staff and field operations in accordance with the orders and policies of the commanding officer. The executive officer usually remains at the battalion headquarters when the commanding officer is away. He also keeps familiar with the battalion and division situation as a whole and, when possible, helps the battalion commander carry out his functions as division engineer.

c. The liaison officer represents the battalion commander at higher, subordinate, or adjacent headquarters. His general duties are listed in FM 101-5. Specifically, he has three missions—

- (1) To keep the engineer battalion commander or executive officer constantly informed of the existing tactical situation, the plans of the unit to which he is sent, and any changes in either.
- (2) Similarly, to advise the commander of the unit to which he is sent as to the plans and tactical situation of his own unit, especially as they affect the former.
- (3) To serve, when authorized, as an adviser to the commander of the unit to which he is sent, concerning the employment of the engineer battalion.

d. The radio operator drives a $\frac{1}{4}$ -ton truck for the battalion commander as required and operates the radio set and cipher converter which are mounted in the vehicle. This radio is operated in the battalion net.

e. One driver drives the $\frac{3}{4}$ -ton weapons carrier which is provided for the general use of the battalion command post. He also acts as orderly for the executive officer. The other driver operates a $\frac{1}{4}$ -ton truck for the liaison officer. The two other vehicles in the section are driven as additional duty by the radio operator and chaplain's assistant.

Section III. DIVISION ENGINEER SECTION

123. ORGANIZATION

The division engineer section consists of the assistant division engineer, a combat construction fore-

man, a draftsman, and a radio operator. Although the battalion commander is the division engineer, he is a member of the battalion command section rather than the division engineer section. His duties are described in paragraph 122.

124. DUTIES OF ASSISTANT DIVISION ENGINEER AND SECTION PERSONNEL

a. The assistant division engineer represents the battalion commander at the division staff and is empowered to make minor decisions for him in his absence. The assistant division engineer must so familiarize himself with all division and engineer battalion activities that he can answer any question put to him by a member of either the division staff or the battalion staff. He is responsible for keeping the engineer situation map at division headquarters accurate and up-to-date.

b. The combat construction foreman and draftsman post information on the engineer situation map and help prepare plans, designs, and specifications for minor works. The combat construction foreman acts as an engineer inspector for the division engineer on any engineer construction project as directed.

c. The radio operator operates the section's radio and converter in the battalion net (fig. 34). He also drives the $\frac{3}{4}$ -ton weapons carrier and serves as orderly to the assistant division engineer.

125. OPERATIONS

The section is primarily a highly important liaison agency between division headquarters and the engi-

neer battalion. It normally operates at the division headquarters where it can readily reach and be reached by the division staff sections. Through its radio in the battalion net, the section can contact battalion headquarters and the combat companies.

Section IV. ADMINISTRATIVE SECTION

126. ORGANIZATION

The administrative section consists of the adjutant (S1), a personnel warrant officer, the sergeant major, a personnel sergeant, personnel specialists, a stenographer, a clerk-typist, a mail clerk, and one truck driver.

127. DUTIES OF ADJUTANT AND SECTION PERSONNEL

(See FM 101-5.)

a. The adjutant is S1 on the battalion staff and initiates or acts on all personnel and administrative actions for the battalion. He is responsible for athletics, entertainment, and morale work when no other officers have been assigned these duties. In the field his duties include—

- (1) Keeping records on the classification, reclassification, assignment, pay, promotion, transfer, retirement and discharge of all personnel.
- (2) Processing awards of decorations, citations, and other honors.
- (3) Processing applications for leaves and passes.
- (4) Maintaining records on military justice procedures and assisting in the review of courts-

martial proceedings from an administrative view.

- (5) Maintaining strength, casualty, and prisoner-of-war reports, and other personnel statistics.
- (6) Obtaining replacements and arranging for their reception, processing, assignment, and quartering.
- (7) Laying out the command post and establishing a standing operating procedure to guide its operation. The latter duty is performed in coordination with the executive officer.
- (8) Preparing plans for shelter, and command and administration of quartering areas.
- (9) Supervising maintenance of sanitation in coordination with the surgeon.
- (10) Providing recreation for battalion personnel and maintaining morale. He exercises general supervision of the chaplain and maintains contact with welfare agencies.
- (11) Operating the postal service.
- (12) Arranging for the collection and evacuation of prisoners of war in cooperation with the battalion S2 and S4.
- (13) Maintaining the unit journal.

b. The personnel warrant officer helps the adjutant in personnel matters. He directs and supervises the activities of the personnel sergeant and the personnel specialists. Specifically he—

- (1) Supervises the preparation and maintenance of records, rosters, correspondence,

and reports pertaining to battalion personnel matters.

- (2) Maintains service records of all battalion personnel.
- (3) Requisitions personnel and handles matters pertaining to transfers and promotions.
- (4) Supervises preparations of payrolls, vouchers, applications, and reports relative to pay, travel, allotments, and deductions.
- (5) Supervises classification and assignment of the battalion's enlisted men.
- (6) See also duties of personnel officer in FM 101-5.

c. The sergeant major supervises and directs section personnel in the preparation of correspondence, records, forms, reports, and orders. He is the adjutant's principal assistant for matters other than personnel. He is also an important liaison between battalion headquarters and the company first sergeants.

d. The personnel sergeant supervises and directs the personnel specialists in the performance of their duties. He is the principal assistant to the personnel warrant officer.

e. The personnel administrative supervisor, personnel management specialist, his assistant, and personnel administrative clerks help in the classification and assignment of the battalion's enlisted men, the requisitioning of replacement personnel, the selection of qualified personnel for special schools, and the preparation of correspondence and reports pertaining to personnel classification and assignment. They interview enlisted men for classification pur-

poses, check for completeness of forms, and record and code additional data. They compile necessary data to maintain personnel records, prepare specialist inventories and information rosters, and maintain officers' and enlisted men's qualification cards. They keep service records, prepare pay orders, 201 files, and perform other personnel administrative functions.

f. The stenographer and clerk-typist perform general administrative work as directed by the adjutant and sergeant major.

g. The mail clerk sorts and distributes mail and drives the section's $\frac{1}{4}$ -ton truck.

h. The truck driver has duties as given in paragraph 18.

128. TRAINING

Personnel of the administrative section are given their general training by headquarters and service company. Normally, enough soldiers with a previous knowledge of typing can be found to operate initially. When necessary, typing schools can be run by the battalion, division, or post. Other administrative training is done on the job or by sending selected personnel to schools conducted by higher headquarters, on quotas made available to the battalion by division headquarters.

Section V. INTELLIGENCE SECTION

129. ORGANIZATION

The intelligence section consists of an intelligence officer, an assistant intelligence officer, a combat engi-

neer intelligence sergeant, a map supply corporal, a camouflage inspector, a draftsman, a photographer, and a driver.

130. DUTIES OF INTELLIGENCE OFFICER AND SECTION PERSONNEL

a. The intelligence officer is S2 on the battalion staff and directs the activities of the intelligence section. He is also battalion camouflage officer. The general duties of an intelligence officer are described in FM 101-5. Typical duties include—

- (1) Collection, evaluation, and dissemination of engineer information. The principal duty of the intelligence officer is to gather and evaluate engineer information and furnish it as needed. He assigns missions to the battalion reconnaissance officer and reconnaissance patrols from the combat companies as required. The information collected pertains to maps; routes of communication; terrain; sources of engineer supplies or usable equipment; engineering structures, both on friendly and hostile territory; all mine fields, booby traps, and obstacles laid by either friendly or enemy troops; and examination of enemy engineer equipment and enemy practices regarding its use. S2 must conserve the effort of reconnaissance agencies by specifying what information is of special importance during a stated period, and by issuing definite re-

connaissance instructions to the gathering agencies.

- (2) Maintaining close contact with G2 who assigns reconnaissance missions to the engineers as an agency in the division collection plan. G2 also furnishes S2 with data, collected by nonengineer agencies, which may be of value to the engineers. S2 on the other hand may, while seeking technical information, discover valuable tactical information which is promptly given to G2.
- (3) Posting of the engineer intelligence map. As an aid in collecting and evaluating engineer information and in disseminating the resulting intelligence, S2 keeps an engineer intelligence situation map. This map shows the result of reconnaissance, classification of roads and bridges, potential water supply sites, sources of local materials, mine-field information (see FM 5-31), results of enemy action, disposition of major units, and other items of engineer intelligence.
- (4) Keeping the S2 journal which contains summaries of important written and oral messages received and sent. It also contains notes of periodic reports, orders, records of important conferences, and similar matters concerning the section. An S2 worksheet is also maintained to facilitate systematic arrangement of engineer information coming into the intelligence section so that all items of a particular subject will be grouped

together for ready reference and comparison. Items are entered on the worksheet by subject rather than by time as in the journal. The journal is a permanent record which the worksheet is not.

- (5) Supervision of intelligence training. S2 assists S3 in supervising training in engineer reconnaissance and combat intelligence. Training must be carefully planned and supervised so engineer troops gain a proper viewpoint on the scope and importance of engineer reconnaissance and the making of engineer reconnaissance reports.
- (6) Conduct of combat intelligence and counterintelligence activities. The S2 has staff responsibility for the planning and execution of combat intelligence and counterintelligence activities in the battalion, including security operations. For example, in cooperation with the S1, he is responsible for censorship of postal matter and security requirements for handling messages. He examines enemy personnel, captured documents, civilians, and material of immediate importance to the unit.
- (7) Procurement and distribution of maps. The intelligence officer procures and distributes maps in accordance with general policies laid down by the division G2.
- (8) Assistance to battalion commander. The S2 helps the battalion commander carry out his functions as a division special staff offi-

cer by furnishing him detailed information on which to base his advice to the division commander.

b. The assistant intelligence officer helps the S2 in his duties and acts as a photointerpreter. The assistant S2 may perform any or all of those duties of the intelligence officer described in FM 101-5 that are applicable.

c. The combat engineer intelligence sergeant under the direction of the intelligence officer supervises the activities of the section. He also helps the intelligence officer in his duties by keeping the intelligence situation map up-to-date, preparing reports, instructing patrol and reconnaissance parties, keeping records, preparing correspondence, and performing other intelligence functions.

d. The map distributor receives or picks up maps for division operations from the corps map depot operated by the map distribution section of the engineer topographic company, corps. Initial issue of maps for division operations is allotted by army or higher headquarters and made available to the division through the corps map depot. When a bulk shipment of maps is ready for the division, the corps map-distribution section makes delivery or, more frequently, notifies the engineer battalion S2, who dispatches the map distributor to make the pickup. The corporal then breaks down the maps in accordance with the policies established in the division standing operating procedure. He notifies the major commands and separate units who pick up their own

maps and make further distribution. The map distributor may distribute the maps if there is transportation available. The breakdown and limited storage is made in a tent or small permanent type building if available. He keeps a small reserve of maps available for emergency use and requisitions small amounts of maps through the corps engineer, as required. Maps issued and in the hands of troops have no salvage value. Maps of an area no longer required for coverage and still in the original package are returned to the map distributor who, in turn, returns them to the corps map-distribution section. Even though the table of organization and equipment shows the map distributor in the S2 section, the division engineer may find it more desirable to put him under the assistant division engineer at division headquarters, where his map supply point will always be more centrally located and more accessible to division headquarters and divisional units.

e. The camouflage inspector instructs and supervises infantry and other personnel in the principles and techniques of camouflage. He demonstrates the use of paint, nets, screens, decoys, and natural materials as camouflaging agents. He assists in planning camouflage for units as requested, particularly for outposts and defensive positions. He helps the intelligence officer in his duties that concern camouflage.

f. The draftsman prepares overlays, sketches, and maps and performs drafting assignments as directed. He also drives the section's $\frac{3}{4}$ -ton truck.

g. The photographer makes, collects, and reproduces information photos.

h. The driver, in addition to driving a 1/4-ton truck for the intelligence officer as required, serves as his messenger and orderly.

131. TRAINING

Like other staff sections, the intelligence section is trained in a variety of ways. The general military training of the enlisted men is conducted by headquarters and service company. The intelligence training is acquired on the job and by attendance at special schools conducted by the division G2 or by the corps or army engineer. Personnel of the intelligence section must be trained to assist the S2 in the processing of incoming information. The large amount of data must be sorted, grouped, and recorded by type, so that related items may be conveniently compared for evaluation and interpretation. Use is made of an S2 journal (or of a combined S2, S3 journal), the engineer intelligence map, the S2 worksheet and files. Information of immediate or potential value to other headquarters must be transmitted promptly to the division G2, to the corps engineer, or to the intelligence section of one of the other services. All intelligence personnel must be taught the principle that "Information is valueless unless in the hands of those needing it when required."

Section VI. OPERATIONS SECTION

132. ORGANIZATION

The operations section consists of the operations officer (S3), his assistant who is also the troop infor-

mation and education officer, a combat engineer operations sergeant, and a group of technicians and administrative personnel. The technicians include a bridge construction supervisor, combat construction specialists, a demolition man, a surveyor, an electrician, a draftsman, and a sign painter. The administrative personnel are a clerk-typist, an information and education assistant, and light-truck drivers.

133. DUTIES OF OPERATIONS OFFICER AND SECTION PERSONNEL

a. The operations officer is S3 on the battalion staff and commands, directs, and supervises the operations section. He is also the battalion atomic, bacteriological, and chemical (ABC) officer. His general duties as operations and training officer are prescribed in FM 101-5. Because of the nature of his duties, the S3 may tend to infringe on the command channels between the battalion commander and subordinate commanders. The S3 should not permit this tendency to develop. Typical duties include to—

- (1) Plan and supervise training of the battalion.
- (2) Plan the allocation of engineer troops and construction equipment to various tasks, and prepare battalion operation orders. He coordinates his plans with S4 to be sure the plan of operations is adequately supported by the supply plan.
- (3) Arrange details for movement of the battalion under tactical conditions.

- (4) Make a continuing estimate of the situation so as to be able to make recommendations at any time on the employment of the battalion.
- (5) Utilize his assistants in the operations section to make technical reconnaissance, designs, and plans for accomplishing engineer tasks.
- (6) Conduct training, inspect chemical equipment, and supervise atomic, bacteriological, and chemical activities of the battalion.
- (7) Keep the engineer operations situation map based on information furnished by the liaison officer, tactical orders, reports from subordinate units, and personal observation. This map shows all the operational information, such as disposition of engineer troops, projects under way, locations of friendly major tactical units, area responsibilities assigned subordinate units, water points, and support being rendered by other engineers. The S3 situation map enables all engineer staff officers to make a continuing study of the situation so they may plan their operations to meet any foreseeable contingency.
- (8) Recommend security measures for battalion headquarters to the headquarters commandant.
- (9) Prepare tactical and technical reports as directed.
- (10) Recommend, when necessary, that requests be made for support by additional engineer

troops, or that higher headquarters assume responsibility for engineer work in a portion of the area assigned to the battalion.

(11) Plan and in coordination with S2 assign to the reconnaissance section and to combat companies reconnaissance missions for engineer operational information.

(12) Coordinate liaison with supporting engineer units.

b. The assistant S3 (also troop information and education officer) helps the S3 in his duties. In addition, he coordinates and supervises orientation, education, and information activities. He recommends means and methods of dissemination and distribution of troop orientation and information material, and makes available facilities for its presentation.

c. The combat engineer operations sergeant is the senior enlisted man in the operations section. He helps the operations officer in performing his duties and in supervising the activities of the section.

d. The bridge construction supervisor helps the operations officer in the reconnaissance, design, inspection, and allocation of material, and equipment necessary for the construction or destruction of bridges.

e. The combat construction specialist, electrician, and demolition men are technical inspectors for the S3 in their specialties. Carpenter and electrical equipment is provided for these technicians to perform such tasks.

- (1) *The combat construction specialists* inspect battalion construction projects, make recommendations, and assist in carpentry problems. They aid the S3 in drawing up plans and bills of material. They instruct in battalion conducted carpentry schools and perform carpentry work for battalion headquarters and headquarters and service company. One of these men receives additional training in atomic, bacteriological, and chemical (ABC) defense. He then assists the operations officer in training and supervising the battalion ABC activities and equipment.
- (2) *The electrician* inspects battalion construction projects, makes recommendations, and assists in electrical problems. He aids the S3 in drawing up plans and bills of material. He instructs in battalion-conducted electrical schools. He performs electrical work for battalion headquarters and headquarters and service company.
- (3) *The demolition specialist* inspects battalion demolition projects, makes recommendations, and assists in demolition problems. He aids the S3 in drawing up demolition plans, including mine fields, quarry operations, bridges, buildings, and assault of fortifications. He instructs in battalion-conducted demolition and mine schools.

f. The surveyor, draftsman, sign painter, and typist perform duties in accordance with their specialties as directed.

g. The troop information and education corporal helps the troop information and education officer. Primarily this assistance consists of clerical duties. He also drives a $\frac{1}{4}$ -ton truck, as required.

h. The two truck drivers perform duties as described in paragraph 18. One drives the section's $2\frac{1}{2}$ -ton truck. The operations officer's driver is also his orderly.

134. TRAINING

The training of the operations section is parallel to that of other headquarters sections. The basic and general training of all enlisted personnel is conducted by headquarters and service company. The technical skills are obtained so far as possible by selection of personnel with previous civilian or military experience. Some special training may be required, particularly for the troop information and education specialist. Most important, however, is the on-the-job training necessary to convert the individual technicians into a smooth-working unit that can handle any operational problem with speed and coordinated planning but without lost motion and disruption of routine work.

Section VII. SUPPLY SECTION

135. GENERAL

The supply section consists of 2 officers, 1 warrant officer, and several enlisted men. It is divided into 4 subsections: administrative, division engineer supply, battalion supply, and water supply, each of which are discussed separately.

136. ADMINISTRATIVE SUBSECTION

a. Organization. The administrative subsection consists of the supply officer (S4), assistant supply officer, supply warrant officer, division engineer supply sergeant, senior supply clerk, and light-truck drivers.

b. Duties of Supply Officer and Administrative Subsection Personnel.

(1) *The supply officer* is S4 on the battalion staff. He picks up at army depots or army supply points and issues to units of the division the engineer material and equipment they need, except for fortification materials. The S4 coordinates and supervises the supply of fortification and construction materials and the procurement of all engineer supplies for the division. He commands and supervises the entire supply section of the battalion and is responsible for its functioning. In general, he must keep in close touch with S2 and S3, with the tactical situation, with the engineer company commanders and their troops, with the division G4, and with all supply installations. The only engineer supply points he normally establishes for supported units are those for water and local materials. The S4—

(a) Studies and collects detailed information on the supply situation, in cooperation with S2. This information includes data on local resources, available credits in depots and other stocks under unit con-

trol, and captured engineer supplies. Using this information, he advises the battalion commander as to availability of equipment and materials.

- (b) Examines engineer requisitions and makes recommendations for priorities of issue.
- (c) Recommends allocation of available engineer supplies, estimates future requirements, and when necessary arranges in advance for using units to draw them.
- (d) Recommends the number and location of water supply points, in his capacity as water supply officer. The recommendations, when approved by the battalion commander and G4, are incorporated into drafts of paragraphs prepared by S3 for inclusion in operation and administrative orders.
- (e) Keeps a continuing inventory of stocks of engineer materials available locally, and arranges for taking over and distributing them.
- (f) Allocates transportation, other than organic, to subordinate units. He must co-ordinate the allocations with other staff officers.
- (g) Supervises the procurement of all classes of supply for the battalion.
- (h) Supervises procurement of all engineer supplies for the division.
- (i) Prepares reports as directed.
- (j) Helps the company commanders with the training of their supply personnel.

- (2) *The assistant supply officer, supply warrant officer, and division engineer supply sergeant* help the supply officer in his duties. They supervise the activities of the subsections to insure the even flow of supplies and see that all requisitions and supply records are kept correctly and up-to-date. The assistant S4 is also the battalion food supervisor. As such, he is responsible for the procuring and distributing of food for the battalion, keeping battalion level mess records, and inspecting all company mess facilities. He has a ration supply sergeant in the battalion supply subsection to help him in these duties.
- (3) *The senior supply clerk* performs clerical and typing duties as directed and assists the other supply clerks as required.
- (4) *One of the truck drivers* drives for the supply officer and acts as his orderly while a second driver drives the $\frac{3}{4}$ -ton weapons carrier. The remaining drivers drive the dump trucks. All drivers in the supply section must help in supply operations as well as drive and maintain their vehicles. They may be required to process requisitions through a depot headquarters, draw supplies, supervise or help in loading and unloading their vehicles, or check issues to other units. The trucks are used for general supply hauling and are allotted to the subsections as required.

137. DIVISION ENGINEER SUPPLY SUBSECTION

a. Organization. The division engineer supply subsection consists of an engineer supply sergeant, an engineer supply specialist, and a supply clerk.

b. Duties of Division Supply Subsection Personnel. The engineer supply sergeant supervises and directs the activities of the subsection. The subsection processes all requisitions and records for engineer supply for all units in or attached to the division. The subsection also supervises the distribution of engineer supplies to all divisional units except the engineer battalion. With the help of the supply specialist and clerk, the sergeant edits and consolidates engineer requisitions, keeps engineer supply records, and receives, breaks down, stores, and issues engineer supplies.

138. BATTALION SUPPLY SUBSECTION

a. Organization. The battalion supply subsection consists of a battalion supply sergeant, a ration supply sergeant, and two supply clerks.

b. Duties of Battalion Supply Subsection Personnel. The battalion supply sergeant directs and supervises the activities of the subsection. With the help of the clerks, he edits and consolidates requisitions for all classes of supplies, keeps supply records, and receives, breaks down, stores, and issues all classes of supplies to the battalion. These supplies include rations, clothing and equipment, petroleum products, signal equipment, and ammunition. The ration supply sergeant procures, breaks down, and issues all rations for units within or attached

to the battalion. He keeps battalion level mess records and submits necessary reports.

139. WATER SUPPLY SUBSECTION

a. Organization. The water supply subsection consists of a water supply foreman and water supply specialists. The specialists are usually organized into four 3-man teams or three 4-man teams.

b. Duties of Water Supply Subsection Personnel. The water supply sergeant (foreman) directs and supervises the activities of the water supply subsection. He is responsible for the maintenance, installation, and operation of water points. He may conduct reconnaissance for locating water supply points and recommend schedules for drawing water. With the help of the specialists he performs the following duties:

- (1) Installs and operates water points.
- (2) Maintains and performs minor repairs on water purification equipment.
- (3) Pumps, stores, and dispenses water.
- (4) Performs tests in the field to identify and measure impurities, to determine the treatment required, to check the effectiveness of treatment, and to insure that the issued water is pure and potable.
- (5) Enforces sanitary, traffic, security, and camouflage regulations at the water point.
- (6) Keeps water supply records and submits necessary reports.

c. Operations.

- (1) Under the guidance of the water supply foreman, the subsection operates several

independent teams. One team is dispatched by the supply officer with the advice of the water supply foreman and the operations officer to a particular location to support each regiment on the line, and one for the reserve regiment and division troops (fig. 33). The fourth unit may be held in reserve or operated with a divisions rear echelon (field trains). Alternatively, a water supply team may be attached to a combat company serving with each combat team. In this latter case, the water supply team selects its own location with the consent of the combat company commander and reports its location to the combat command and to engineer battalion headquarters. However, in either event the team operates quite alone. Depending upon its location, the team may be attached to an adjacent unit for rations, or rations may be delivered by headquarters and service company and prepared by the team with its small cooking units.

- (2) Four of the supply section's 1-ton trailers are usually assigned to the water supply subsection. These are used to carry the water purification sets. One truck and trailer is necessary to transport each team and its equipment to successive sites. The truck is unloaded at the site and returns to its base, leaving the trailer, equipment, and men to set up and operate the water point. The reserve set is sometimes used to "leap-

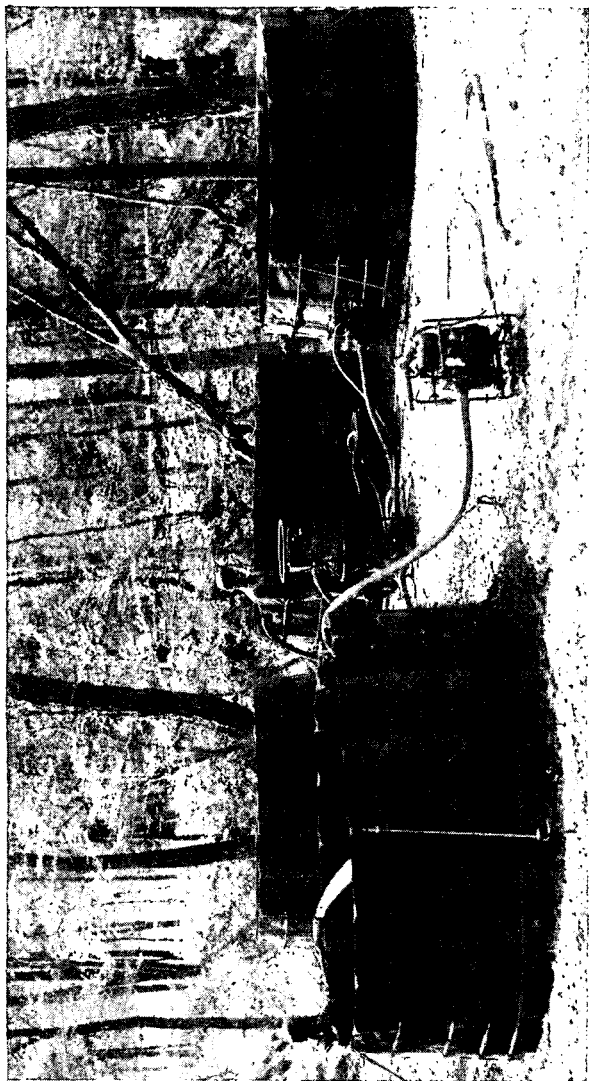


Figure 33. Engineers operating a water supply point.

frog" another water point. The new water point is put into operation and the old one pulled back for inspection, maintenance, and repair, and thus in turn becomes the reserve set ready for further operation. Additional mobility and speed in going into and out of operation may be obtained by bolting some of the purification unit to the floor of each trailer. This eliminates the necessity of completely loading and unloading, connecting and disconnecting the whole set for each move.

- (3) The water supply sergeant attempts to visit each water point every day to deliver supplies, food, and mail, and to help the team at the point with any difficulties that come up from day to day.

d. Training. The organization of the water supply subsection lends itself to on-the-job training and to the advancement of inexperienced men assigned to it. The technique can easily be learned on the job if some of the crew are experienced. The water supply foreman is furnished with the cadre and may be appropriately used to train the entire subsection in a short but intensive school-type course. School quotas are utilized when available to train the most promising members of the subsection for the more technical jobs. See TM 5-295 and SFS 5-108 "Potable Water Purification Equipment."

Section VIII. COMMUNICATION SECTION

140. ORGANIZATION

The communication section consists of the communication officer, a communication chief, radio operators, a radio mechanic, switchboard operators and wiremen, message center clerks, and a driver.

141. DUTIES OF COMMUNICATION OFFICER AND SECTION PERSONNEL

a. The communication officer commands the communication section, and as a staff officer supervises all communications activities and the operational maintenance on signal equipment in the entire battalion. In general he must—

- (1) Advise the battalion commander and staff on matters of signal communication technique.
- (2) Prepare plans and supervise the establishing, operation, and maintenance of the engineer communication system.
- (3) Supervise technical training of communication personnel, when so directed.
- (4) Offer technical advice and assistance to S4 regarding supply of signal communication materials for the battalion.
- (5) Make recommendations in coordination with S1, for initial and successive locations of the command post of the battalion, if not prescribed by higher authority.
- (6) Make recommendations for procuring and replacing signal communication personnel.

- (7) Establish and operate the communication center.
- (8) Develop prearranged messages in coordination with S3, for use in operations.

b. The communication chief helps the communication officer in his duties. The communication chief supervises the section in the installation, operation, and maintenance of the wire and radio communication facilities. He may instruct and train communication personnel in the techniques of field communications. He supervises the radio operators in operating the battalion net control station.

- (1) As communication center chief he directs and coordinates all phases of communication center operations to insure the transmission of all messages with the utmost speed, accuracy, and security. He supervises and instructs communication center personnel in the function of a message center and in the performance of individual assignments.
- (2) He keeps necessary records pertaining to the operation of wire, radio, and message center activities.

c. The message center clerks operate the battalion message center under the direct supervision of the communication chief. Their primary functions are to receive, transmit, and distribute messages, and to keep the necessary records pertaining thereto. One clerk drives a $\frac{1}{4}$ -ton truck, as required.

d. The switchboard and radio operators operate the wire and radio facilities of the communication section and perform minor maintenance on the equip-

ment. They operate the battalion net control station on a 24-hour-a-day basis. They help install the section's equipment. One radio operator drives the weapons carrier as an additional duty.

e. The wiremen help install the wire equipment and make minor repairs. They are also trained to be alternate switchboard and radio operators.

f. The radio mechanic does organizational maintenance on signal equipment in the communication section and in headquarters and headquarters and service company. He assists in the installation of wire and radio equipment.

g. The truck driver drives the 2½-ton truck which carries most of the section's personnel and their equipment.

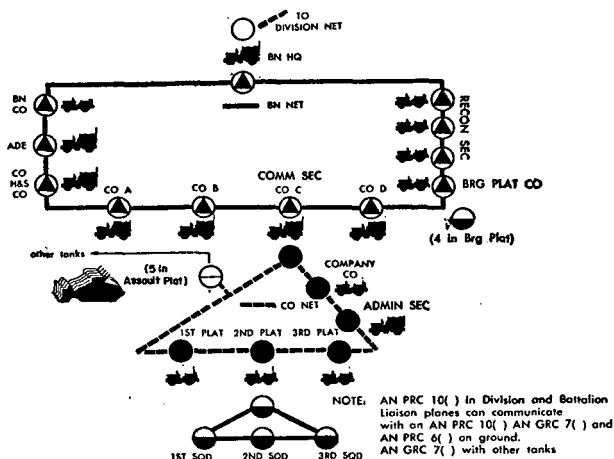
142. OPERATIONS

The communication section controls the battalion radio net, operates the radio for communications with division headquarters, operates the telephone system and message center, and does organizational maintenance on Signal Corps equipment in battalion headquarters and headquarters and service company. Operators are provided for 24-hour-a-day communication. See FM's 7-24 and 7-25 for more details on communications in the division. See figure 34 for battalion radio nets.

143. TRAINING

The training of the communication section presents no particular problem since the chief, the radio mechanic, and one of the operators are provided in the cadre. The chief must train the telephone crew

RADIO NETS IN ENGR C BN DIV



CHARACTERISTICS					
SET:	AN PRC-6() ¹	AN PRC-10() ²	AN GRC-7() ³	AN GRC-9()	SCR-193
RANGE IN MILES—PHONE (STATIONARY)	1	5	10	15	20
(MOVING)	—	—	—	10	15
RANGE IN MILES—CW (STATIONARY)	—	—	—	30	60
(MOVING)	—	—	—	20	30
MODULATION	FM	FM	FM	AM	AM
FREQ. RNG—MC—TRANS.	47.0-58.4	38.0-54.9	38.0-58.4	2.0-12.0	1.5-6.2
FREQ. RNG—MC—REC.	47.0-58.4	38.0-54.9	38.0-58.4	2.0-12.0	1.5-18.0
EMISSION—PHONE	YES	YES	YES	YES	YES
EMISSION—MCW	NO	NO	NO	YES	YES
EMISSION—CW	NO	NO	NO	YES	YES
VEHICLE VOLT REQD.	—	—	12-24	6-12-24	12
WEIGHT IN POUNDS	6.5	20	215	210	210
¹ REPLACES SCR 536 ² REPLACES SCR 300 ³ REPLACES SCR 508 & AN VRC IN THE ASSAULT PLATOON.					

RECAPITULATION						
SET	AN PRC-6()	AN PRC-10()	AN GRC-7()	AN GRC-9()	SCR-193	TOTAL
(ONE LETTER CO.)	(12)	(6)	(—)	(1)	(—)	(19)
4 LETTER CO.S	48	24	(—)	4	(—)	76
HQ & HQ & SV. CO.	4	(—)	5	8	1	18
TOTAL	52	24	5	12	1	94

Figure 34. Radio nets, engineer combat battalion, divisional.

(FM 24-20 and FM 24-75) and the message center clerks (FM 24-17). The cadre radio operator trains the others (FM 24-6 and FM 24-18). The radio mechanic must train one or more of the radio operators to understudy him as an additional duty. As is the case with the other staff sections, the training in general and basic subjects is conducted by headquarters and service company.

Section IX. RECONNAISSANCE SECTION

144. ORGANIZATION

The reconnaissance section consists of a reconnaissance officer and three identical reconnaissance teams each consisting of an engineer reconnaissance sergeant, a driver, and a radio operator.

145. DUTIES OF RECONNAISSANCE OFFICER AND SECTION PERSONNEL

The reconnaissance officer exercises immediate supervision over the reconnaissance section. He instructs and dispatches the reconnaissance teams and personally participates in the more important missions (figs. 35 and 36). He works in close cooperation with the intelligence, operations, and supply officers to prevent inefficient overlapping of missions and to insure that the reconnaissance problem is understood exactly. The engineer reconnaissance sergeant, the driver, and the radio operator must be able to take over each other's duties in the event of casualties.

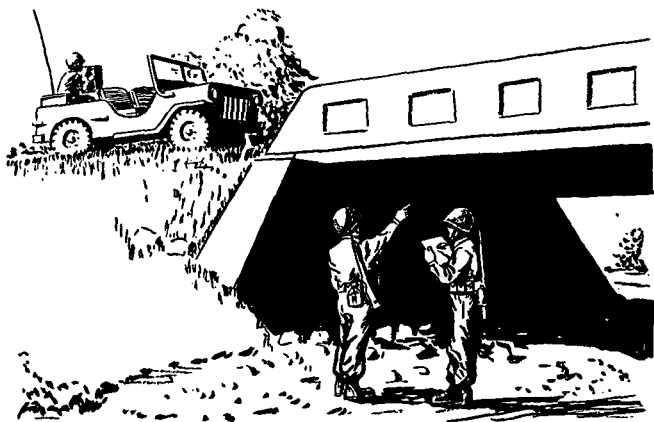


Figure 35. Reconnaissance teams investigate all bridges.

146. OPERATIONS

a. The section operates as three teams under direction of the reconnaissance offices who operates under S2 control, but may conduct reconnaissance for any section of the headquarters in coordination with S2. When on a reconnaissance mission, the team's ultimate aim is to get information to battalion headquarters. The proper mental attitude is one of desiring to avoid combat. However, when combat is necessary to avoid capture or to secure the required information, the team must fight very aggressively. The fighting is broken off at the earliest opportunity to avoid unnecessary delay in obtaining and reporting information and the chance of being captured or becoming casualties. One reconnaissance team normally accompanies the advance guard of each regimental combat team in the advance to secure engineer information as early as practicable. Information is

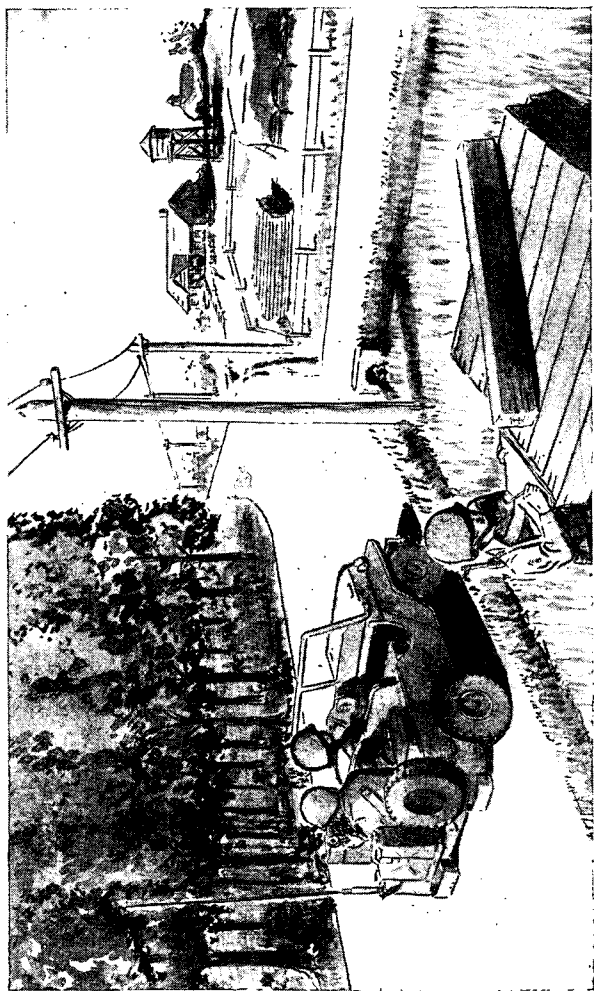


Figure 36. Reconnaissance elements report location of all usable construction materials.

sent back to the supported unit and to the engineer battalion.

b. Reconnaissance personnel, as well as commanders and other officers use light aircraft for reconnaissance missions when possible. Light aircraft within the division are normally made available to the engineers as required. Suggested mission for use of aircraft include to:

- (1) Locate general sites for water points.
- (2) Locate and estimate quantities of engineer material in specific areas.
- (3) Make reconnaissance (fig. 37) of roads, railroads, routes, and bridges.
- (4) Locate enemy obstacles.
- (5) Check camouflage effectiveness.
- (6) Locate prospective bivouac areas.
- (7) Locate advanced airfield sites.
- (8) Locate timber areas.
- (9) Provide fast transportation of small critical items of supply.
- (10) Evacuate sick and wounded.
- (11) Locate river-crossing sites.
- (12) Control columns in route marches and observe roads ahead of the column.
- (13) Provide a radio relay service.
- (14) Provide air travel to other headquarters and units.
- (15) Provide an accuracy-check on terrain maps.
- (16) Provide an aerial view for the sketching of local areas.
- (17) Perform photographic missions.



Figure 37. Light aircraft being used for reconnaissance by air.

147. TRAINING

The teams must be trained to secure the desired information accurately and in a minimum of time and to fight aggressively in infantry combat. The members of the team must be taught to do each other's jobs. Each member must be able to complete a mission alone if the other members of the team become casualties. The reconnaissance sergeant must be able to drive the truck and operate the radio. Both the radio operator and the driver help the sergeant in securing information by measuring, counting, or estimating. The S2 must train the reconnaissance officer thoroughly in his important role. The reconnaissance officer must get all of the requirements and instructions from the section requesting information and then make certain that the team making the reconnaissance understands the directions perfectly.

Section X. BATTALION MAINTENANCE SECTION

148. ORGANIZATION

The battalion maintenance section consists of a motor officer, his warrant officer assistant, a motor maintenance sergeant, an engineer equipment maintenance supervisor, a parts specialist, blacksmith, machinist, light-truck driver, wrecker operator, painter, body repairman, welders, mechanics and mechanic's helpers.

149. DUTIES OF BATTALION MAINTENANCE OFFICER AND SECTION PERSONNEL

a. The battalion motor officer exercises immediate supervision over the motor maintenance section. His duties are to—

- (1) Advise the battalion commander, his staff, and subordinate commanders on technical aspects of automotive and equipment operation and maintenance.
- (2) Direct the supply and operations of the maintenance section.
- (3) Direct the training of drivers, mechanics, and operators.
- (4) Prepare reports and keep records on equipment and supplies.

b. The warrant officer under the immediate supervision of the motor officer directs the operation shop, giving technical advice and help to all company motor pool personnel as well as the battalion shop personnel. His duties are to—

- (1) Check incoming repair work to determine amount and exact nature of repairs.
- (2) Set up maintenance schedules on vehicles and equipment in accordance with existing directives.
- (3) Assign repair and maintenance work.
- (4) Inspect shop operations to insure that repair schedules are maintained and that correct methods are being used.
- (5) Check completed work to insure that vehicles and equipment are in proper operating condition before being released from the shop.

c. The battalion motor maintenance sergeant under the supervision of the motor officer and warrant officer directs the activities of the maintenance section. He helps in preparing reports, keeping records and files, and training personnel. He recommends job assignments and priorities.

d. The engineer equipment maintenance supervisor under the supervision of the motor officer and warrant officer directs the activities of the engineer equipment mechanics. He assigns and inspects work, and gives technical advice and help to the mechanics. He prepares necessary reports and keeps records and files on the engineer equipment. He assists in training equipment operators and may, under certain circumstances, supervise the use of the equipment.

e. The parts specialist receives, stores, and issues parts. This service is for all company maintenance sections as well as for the battalion maintenance section. He prepares all paper work in accordance with existing directives for the requisitioning, storing, issuing, and returning of parts; this includes a parts locator card file system.

f. The machinist operates the equipment carried by the shop equipment truck to repair parts and to make minor parts which cannot be obtained in a reasonable time through supply channels.

g. The mechanics under the supervision of the chief wheeled vehicle mechanic and chief engineer equipment mechanic perform organizational maintenance and repair, and conduct inspections on vehicles within their specialties. One of the mechanics and two mechanics' helpers drive the section's

2½-ton dump trucks and ¾-ton truck as an additional duty.

h. The blacksmith, painter, and body repairman perform duties within their specialties as directed.

i. The welders do general welding work for the battalion, using electric arc welding sets. They may work in the motor pool area or perform special welding missions in the field. One welder also drives the shop truck.

j. The wrecker operator operates and drives the heavy wrecker. He is particularly useful in evacuating damaged vehicles for repair, performing winching operations, and lifting loads not requiring a crane. He is qualified to use the oxyacetylene torch carried on the wrecker.

k. The driver in addition to driving a ¼-ton truck performs messenger missions for the motor officer.

150. OPERATIONS

The battalion maintenance section provides organizational maintenance for all vehicles, outboard motors, chain saws, and for water supply and other equipment. The battalion maintenance section may operate under supervision of the S4. The organizational maintenance performed by the battalion maintenance section does *not* relieve drivers and operators of their preventive maintenance responsibilities, nor does it relieve the company maintenance sections of their organizational maintenance duties. The separation between battalion and company responsibility is well-defined in the field of maintenance inspections. The 6,000-mile and semiannual maintenance inspections are performed by the battalion

maintenance section while the companies conduct the weekly, monthly, and 1,000-mile maintenance inspections. The battalion section also conducts technical and spot-check inspections and helps the battalion commander conduct command inspections. For further details see AR 750-5 and TM's 37-2810 and 38-660. (In the field of vehicular repair the line between company and battalion is not clearly drawn.) In general, provided the parts are readily available, the companies make such repairs as the time and tools available and the skill of their mechanics permit. The battalion maintenance section issues parts and repairs supplies to the companies. The equipment and maintenance platoon of headquarters and service company is entirely separate from the battalion maintenance section, and is in the same position in relation to it as are the equipment and maintenance sections of the combat companies.

151. TRAINING

Because the movement of a modern army depends so largely on the condition of its motor vehicles and the effectiveness of its engineer equipment, the proper training of the battalion maintenance section is vital. However, there is no easy road to a satisfactory status of training. The motor officer must exercise all of the ingenuity at his command to get the required individual specialists trained. Some mechanics are furnished with the cadre and others can be trained on the job, but many of the specialists must be found or made individually. The blacksmith, machinist, and painter are examples. If a search of the battalion personnel qualification cards

reveals that no men with civilian or military experience are available, considerable individual training is required. Even if the motor officer or one of his principal assistants has the necessary experience to teach one or more of these subjects, enough time is not available to conduct such teaching while performing a regular full-time job. Therefore, full advantage must be taken of any quotas available for ordnance or engineer schools. When school quotas are not available, it is usually possible to arrange for the on-the-job training of a selected soldier by a qualified technician in a nearby engineer unit. In addition to individual training, the section needs considerable "shakedown" training to enable it to move and work as an efficient team. Further training develops smooth relations between the section and organic companies, the battalion supply section, and the division ordnance supply section.

Section XI. CHAPLAIN SECTION

152. ORGANIZATION

The chaplain section consists of the chaplain and his enlisted assistant.

153. DUTIES OF THE CHAPLAIN

The chaplain is advisor to the battalion commander and staff on all matters pertaining to religion and welfare. He furnishes spiritual guidance and religious services for all members of the battalion and performs appropriate duties as covered in AR 60-5 and TM 16-205. The chaplain's assistant performs such duties as the chaplain may direct, including duty as a light truck driver.

Section XII. MEDICAL DETACHMENT

154. ORGANIZATION

The medical detachment consists of a medical officer, a medical assistant (Medical Service Corps officer), a detachment and assistant detachment sergeant, company aid men, an aid station attendant, medical aid men, medical records clerk, ambulance driver, and truck drivers. No formal organization exists for company aid teams. Aid men are attached to the companies in accordance with the anticipated need for their services.

155. DUTIES OF MEDICAL OFFICER AND DETACHMENT PERSONNEL

a. The medical officer commands the battalion medical detachment and supervises the medical service of the battalion. He serves as adviser to the battalion commander and staff on matters affecting the health of the command and the sanitation of the battalion area. In general the medical officer :

- (1) Instructs the battalion personnel in personal hygiene, military sanitation, and first aid.
- (2) Makes medical and sanitary inspections, and keeps the battalion commander informed of the medical situation in the battalion.
- (3) Establishes and operates the battalion first aid station and dispensary.
- (4) Requisitions the medical supplies and equipment required by the medical detachment.
- (5) Prepares the medical plan, including recom-

mendations for location of the battalion aid station.

- (6) Verifies the status of medical supplies in all elements of the battalion, and takes steps to insure timely replenishment.
- (7) Supervises the collection and evacuation of the wounded.
- (8) Supervises the preparation of casualty lists, the monthly sanitary report, and other required records pertaining to the medical service.

b. The medical assistant (a Medical Service Corps officer) helps the medical officer in his duties. The assistant to the medical officer may be directed to:

- (1) Help the medical officer render preventive and first aid services, inspections, and lectures.
- (2) Conduct reconnaissance for locating and establishing the medical aid station.
- (3) Supervise detachment personnel.
- (4) Verify immunization records.
- (5) Conduct classes in selected subjects to help train the medical detachment and other battalion personnel.
- (6) Perform supply, transportation, and administrative functions.

c. The detachment and assistant detachment sergeants under the supervision of the medical officer direct the activities of the detachment, help the medical officer render preventive and first aid services, inspections, and lectures, and assign tasks to the detachment personnel.

d. Other detachment personnel administer first aid, act as company aid men, drive trucks and the ambulance, keep records, and prepare reports and correspondence. One medical aidman drives the detachment's 2½-ton truck.

156. OPERATIONS

The medical detachment supervises the medical training and sanitation in the battalion. The detachment provides company aid men, operates a battalion aid station and dispensary, and evacuates casualties to the division clearing company. Dental care for the battalion is centralized in the division, normally in the vicinity of the division clearing station. See appendix III for operations in infantry combat.

157. TRAINING

The personnel of the medical detachment must acquire individual technical skills and the ability to work as a team. Practice in the fields of sanitation, inspection and treatment of disease and minor injuries are available during peacetime, but evacuation and the treatment of battle casualties are not easily taught in the zone of interior. Yet they are of extreme importance because of the disastrous consequences to the morale of a battalion if, during its first encounter with the enemy, its medical detachment falters. The medical officer must give thorough and careful instruction so personnel do acquire the necessary knowledge. He then must provide opportunities for practice. The detailed description of the work performed by the detachment as contained in FM 7-20, FM 7-30, FM 8-10, and FM 21-10, should be used in planning and conducting the training.

CHAPTER 5

BATTALION OPERATIONS

Section I. GENERAL

158. EMPLOYMENT

Although all of its squads, sections, platoons, and companies are usually in operation simultaneously, the battalion works as a unit only during some phases of training, on very large engineering projects, or as infantry in combat. It can execute all types of normal engineer administrative and combat operations, especially those needed by the infantry division. Normally one of the engineer combat companies operates in direct support of each committed infantry regiment. The remainder of the battalion performs engineer missions in the division area and is prepared to reinforce the leading engineer companies as required. Engineer troops are attached to nonengineer units only when necessary engineer assistance cannot be given by direct or general support. This gives the division engineer proper control of his troops, and provides for the maximum flexibility and effectiveness of engineer effort within the infantry division.

159. STANDING OPERATING PROCEDURE

A battalion standing operating procedure (SOP) on battalion functions helps greatly in initiating

smooth functioning throughout the battalion and in training incoming officers. It saves time and effort, increases efficiency, and helps to standardize procedures. A bulky SOP defeats its own purpose. To be effective, an SOP is informative, understandable, and complete, yet concise and to the point. Appendix II shows an SOP sample outline.

160. SECURITY

Each commander is responsible for the security of his unit. Security includes all measures taken by a commander to protect the unit against enemy interference, surprise, and observation. The measures adopted should be appropriate to the threat; as the danger becomes greater, security measures are increased. For the engineers, security measures are required to protect troops and equipment in bivouac, during movement, and in stationary positions such as completed bridges and their approaches, and bridges prepared for demolition; and to protect work parties. Work parties are sometimes protected by infantry elements so more engineer troops can be released for work on the project. Details of composition, organization, operation, and nomenclature of security elements are given in FM 7-10 and FM 7-20.

Section II. TRAINING

161. GENERAL

This section outlines the progressive training, from the basic and advanced individual training, through unit, combined, and concurrent training of

the engineer combat battalion, divisional. Keep in mind that training never ceases—before, during, or after combat—and that the ultimate goal of all training is success in battle.

162. RESPONSIBILITY

a. Commanders of all echelons and each major command are responsible for training the engineer troops and troop units assigned or attached. The battalion commander is responsible for the training of his organization. Similarly, the company commanders are responsible for the training of their units. The battalion operations and training officer (S3) prepares detailed training schedules and makes recommendations concerning training to the battalion commander. He also establishes battalion-level schools for officers, noncommissioned officers, and specialists, including communication.

b. Subject to modifications imposed by the divisional training directives; training normally follows the army training programs (ATP's) set up by the Department of the Army, as a general guide. In accordance with the infantry division training programs, they prescribe the training subjects and the minimum time to be spent on each subject during each phase of training. Throughout all training, the application of prior instruction to current training is stressed. Instruction in a subject once completed must not be neglected; it must be applied whenever possible and concurrently with other training.

163. MANAGEMENT

a. Preparation. Thorough preparation by the instructor and effective presentation of instruction by coordinated explanation, demonstration, application, and examination are most important. Every effort must be made to insure that instruction, whether classroom, field, or on-the-job training, is carefully prepared and presented in an understandable, interesting, and dynamic way. A well-developed program of training includes items of eye-appeal, personal interest, inspiration for competition, personal experience, and minor controversial interest. The skilled instructor conducts training with the idea in mind of incorporating all or part of these features in his program, along with basic items of subject coverage, training aids, and specific equipment. Fundamental training doctrine and principles of training are outlined in FM 21-5, FM 100-5, and TF 7-295. Detailed instructions for engineer training are in FM's, TM's, and ATP's of the 5-series. Special training instructions are published in training circulars and periodic training directives. Department of the Army publications, training films and film strips, and visual training aids are listed in SR 310-20-3, 310-20-4, 310-20-5, 310-20-6 and 110-1-1, and FM 21-8. Additional necessary training aids should be prepared to accomplish the training mission effectively. To be of maximum value to the student all instruction and training should follow these recognized steps:

- (1) Instructor preparation
- (2) Instructor explanation

- (3) Instructor demonstration
- (4) Student application
- (5) Student examination
- (6) Instructor-controlled discussion.

b. Equipment. Newly activated engineer units are normally furnished enough equipment to permit effective training. If the equipment is inadequate, every effort must be made through proper supply channels to obtain that which is necessary. If needed equipment is still not available, expedients must be constructed and used. Proper utilization and economy of equipment requires that the training schedule be arranged so available equipment can be rotated among using units.

c. Training Time. A general breakdown showing total time to be devoted to each subject in a 40- or 48-hour week is given in army training programs. This is a minimum training week; night operations, bivouacs, field exercises and maneuvers normally require much additional time. Specific number of weeks of basic, unit, and combined training periods are published from time to time by the Department of the Army.

d. Training Areas. Although some engineer training can be conducted almost anywhere, every effort should be made to approximate the terrain and climate of the probable theater of operations. Large training areas are necessary so training in such subjects as explosives and demolitions can be safely isolated. Training areas should be selected for great variety of conditions. Examples are: flat, rolling, and mountainous terrain; numerous types of roads and bridges; dry and muddy ground conditions;

sand, clay, loamy, and rocky soils; many kinds and sizes of standing timber; and streams, lakes, and gullies of various depths and widths.

e. Supervision. High-quality, thorough training requires active personal supervision by higher echelon commanders and their staffs, as well as the battalion commander and staff. Each company commander constantly supervises the training of his unit. Administrative work must never be allowed to interfere with the primary mission of training.

f. Inspections.

- (1) Each command level is responsible for the training of subordinate units. Frequent training inspections are made to check on the progress of training and to determine what training must be stressed to reach required standards. Inspections cover all phases of training. Engineer soldiers are first tested in their individual military and technical proficiency, and then on their abilities as members of an engineer unit. Actual successful performance by the man being trained is the only true test of successful training.
- (2) Inspecting officers must be just, impartial, and constructive in their criticism. They must help and teach, as well as uncover faults and deficiencies. Inspections are timed to avoid interfering with the training program. In this connection, it is desirable for several inspectors to conduct their inspections simultaneously.

164. ESSENTIAL TRAINING PHASES

a. General. The training program for a newly activated engineer combat battalion, divisional, is outlined in ATP 5-300 (Mobilization). The program covers the cadre, individual, and unit training phases from the time of assembly of cadre until entry of the battalion into field exercises and maneuvers with the infantry division.

b. Objective. The objective is to train the battalion to perform the combat and combat construction duties that are critical in importance and normal to the unit's performance in the field.

165. CADRE TRAINING PHASE

a. General. A 4-week period prior to the start of basic individual training is allotted to cadre testing, training, and organization. Subjects to be covered are listed in ATP 5-300 (Mobilization).

b. Purpose. The purpose of this training period is to: test the proficiency of the cadre and make necessary corrections; review the employment, duties, and T/O&E of the engineer combat battalion, divisional; refresh the cadre in basic military and engineering subjects; review training methods and management; ascertain post facilities for training aids and areas; and to conduct organization and administrative duties.

166. BASIC INDIVIDUAL TRAINING (BASIC MILITARY)

a. General. Filler personnel from reception centers assigned to the battalion undergo 6 weeks of basic military training applicable to the army as a whole

in accordance with ATP 21-110 (Mobilization). The basic engineer subjects introduced during this phase of individual training are common to all privates regardless of arm or service.

b. Purpose. Basic military training is designed to orient the individual into the Army way of life. It teaches him to care for himself, his equipment, and his fellow soldier. It prepares him for advanced individual training and to take his place as a member of the military team.

c. Subjects Covered. The schedule of subjects to be covered during basic individual training in the battalion is shown in ATP 5-300 (Mobilization). Included in this phase of training are such subjects as character guidance, military courtesy, military justice, dismounted drill, guard duty, care of clothing and equipment, first aid, individual weapons qualification, technique of fire and combat, mines and booby traps, sanitation and hygiene, map reading, protection against biological, radiological (see SR 350-80-1) and chemical attack, safeguarding military information, supply economy and physical training.

167. ADVANCED INDIVIDUAL TRAINING (BASIC ENGINEER TRAINING)

a. General. The advanced phase of individual training is devoted, principally, to basic engineer subjects. The 3-week program scheduled in ATP 5-300 (Mobilization) is appreciably shorter than the branch material training conducted at engineer replacement training centers (ERTC's). The additional hours of the ARTC-type training have been incorporated in the unit training phase of a newly

activated engineer combat battalion, divisional, for greater training value for time expended.

b. Purpose. The purpose of advanced individual training is to qualify the individual soldier in general engineering subjects. It also enables the unit commander to appraise the qualifications and aptitudes of the individual soldier in filling the specialists' positions of the T/O.

c. Subjects Covered. The military engineering subjects for all members of the battalion include: engineer reconnaissance, squad and platoon tools, rigging, camouflage, hasty fortifications, preparation of obstacles, demolitions, mines and booby traps, map and aerial photograph reading, road construction, and fixed and floating bridges. (See ATP 5-300 (Mobilization).)

168. REPLACEMENT TRAINING

All replacements received by the battalion after completion of its unit training who have not received advanced individual training must be qualified in general engineering subjects. If possible, the full branch-material advanced individual-training course as conducted in ERTC's is given these fillers.

169. UNIT TRAINING

a. General. Unit training of the battalion consists of training in all phases of combat operations. During this phase, the battalion normally spends much of the time in the field working under simulated combat conditions. Increased emphasis is placed on leadership, administrative efficiency, unit integrity and teamwork, morale, and supply econ-

omy. Competitive exercises between units can be used to advantage during this period to promote excellence in performance of tasks and pride of individuals in their units.

b. Purpose. The purpose of the unit training is to develop and polish the skills learned in individual training and to teach men to perform as members of the team.

c. Specialist Training.

- (1) The unit commander is responsible for selecting individuals to fill the military occupational specialties (MOS) of the T/O which are not filled by the cadre or will not be filled by phased-in fillers from engineer and other technical service RTC's. The technical training needed to qualify the individual soldier in his MOS in accordance with ATP 5-300 (Mobilization) is accomplished mostly during the unit training phase by on-the-job training, or in schools set up at company, battalion, or higher level. Unit specialist school training programs follow, as closely as possible, the course of instruction given to similar specialists of service schools. The various service schools furnish the programs of instruction (POI) upon request. The POI's are utilized as a guide. The unit commander adjusts such courses commensurate with the ATP for his unit, eliminating nonspecialist training from the course. Nonspecialist training requirements are adequately covered in ATP 5-300 (Mobilization). Specialists to

be trained exclusively in the unit, and those which are trained in part by the unit, are also listed in ATP 5-300 (Mobilization).

- (2) After men have learned their specialties and how to function as a team, they learn the jobs of the other men in the same section provided it does not interfere with the accomplishment of the primary mission. For example, radio operators and radio mechanics should know each other's jobs, as should members of the reconnaissance teams.

170. PHASES OF UNIT TRAINING

a. Basic. Basic unit training provides the team training in which individuals are welded into effective squads and platoons. Emphasis is placed on performance of combat and combat construction tasks requiring hand labor, drill type organization, and use of field expedients.

b. Advanced. Advanced unit training provides team training in company and battalion tasks with the platoons or squads reinforced with heavy engineer equipment.

c. Combined. The engineer battalion now takes its place in the infantry division and functions as the "division engineers." Field exercises and maneuvers are held under simulated combat conditions. Ordinarily, the normal association of engineer combat companies with infantry regiments is maintained during combined training to promote maximum coordination and understanding between supporting and supported units during combat. The bridge

platoon is employed in conjunction with the engineer combat companies, in both fixed and floating bridge problems. The assault platoon is also employed with the engineer combat companies in performing rough "dozer" work under simulated fire and furnishing fire support with the tank armament. The command, staff, and administrative sections throughout the battalion receive practical and intensive training in their respective fields. Approximately one week of the combined training period is devoted to proficiency testing of the battalion by the army commander or other authority responsible for unit training.

171. CONCURRENT TRAINING

a. General. To increase the realistic effectiveness of training, arbitrary boundaries between training phases are to be avoided and efforts are made to integrate and relate each subject to another subject and all subjects to the team mission. This will entail to some degree the concurrent conductance of basic, advanced individual, specialist, and unit training. Judicious application of this principle without violating that of logical progression will result in attainment of the maximum teamwork and military effectiveness for time expended. Review of basic military and technical subjects must be regularly incorporated into the progressive training phases. Tactical requirements are included in many technical exercises, such as providing security for bridge construction projects; and protection of working parties and obstacles from both ground and air attack. Throughout all phases of training, and particularly during

unit training and field exercises, initiative and a sense of responsibility must be developed in officers, noncommissioned officers, and other personnel having potential leadership ability. Each commander must integrate leadership exercises throughout all training phases particularly during periods of tactical and technical training. Command is decentralized and interference with subordinate commanders kept to a minimum consistent with coordinated effort. All personnel must be instilled with the idea that they must decide on and quickly take necessary steps in a situation which requires immediate action and where specific orders are not available.

b. Supply Economy. Throughout all training phases, every opportunity must be used to stress supply economy. All engineer personnel must be thoroughly trained to understand that, particularly in theaters of operation, supply is a crucial factor. Training and supervision of all personnel in the conservation, care, and maintenance of individual and organizational supplies and equipment must be continuous. Definite responsibility for each item of equipment and supply, in storage or in use, is placed upon an officer or enlisted man. Continued aggressiveness by all commanders and supply personnel is required to stress supply economy and the proper care of government property.

c. Staff sections and administrative personnel. The engineer battalion must have well-trained and highly coordinated staff and administrative sections. See chapter 4 of this manual and FM 101-5. Their training, both individually and by sections, is continuous. Additional individual training may be re-

ceived in special schools conducted by battalion or higher headquarters. Standing operating procedures (SOP's) for these elements, as well as for the operating echelons, should be established at the command level where they can be coordinated with SOP's of higher echelons. Imagination, initiative, realism, and close supervision are necessary in training this type of personnel.

d. Tactical Training. Closely tied-in with all engineer training is progressive instruction in combat principles applied particularly in conjunction with security on the march, in bivouac, and at work sites. Infantry methods and formations prescribed in FM's 7-10, 7-20, and 21-5 should be used as a guide, but they must be adapted to engineer strength, armament, and organization. A typical reorganization of the engineer combat battalion, divisional for combat as infantry is shown in appendix III.

Section III. ADMINISTRATIVE MOVEMENTS

172. ENGINEER ASSISTANCE TO OTHER ARMS

a. General. The division usually needs engineer help when it moves. The engineer work generally consists of—

- (1) Providing facilities and assistance during loading and unloading at entraining, embarkation, detraining, and debarkation points.
- (2) Maintaining roads and bridges.
- (3) Making and posting warning and directional road signs.

- (4) Preparing the new area to receive the unit. This involves providing or improving facilities.

b. Employment. This engineer work normally requires keeping some engineers at the starting point until the bulk of the division has departed; providing an engineer advance party to prepare the new area; and sending some engineers with each major echelon moving independently. All of these engineers normally remain under control of the division engineer. In general, engineer assistance is limited to work of benefit to the division as a whole, or to work for which engineers are better trained and equipped than other troops. Other units provide their own facilities and labor as far as practicable.

173. ENGINEER WORK AT ENTRAINING POINTS

a. Type of Work. Engineers at entraining points may—

- (1) Construct or strengthen ramps and loading platforms.
- (2) Construct or improve routes of approach.
- (3) Construct or improve railway spurs and sidings.
- (4) Help troops of other arms to load and lash equipments.
- (5) Convert railway cars for special uses, such as modifying flatcars to accommodate equipment.

b. Loading Facilities. Every effort is made to choose entraining points that require only a minimum of new construction or improvement. However,

loading ramps and platforms often have to be built. Loading facilities are of two general types: side-loading and end-loading (FM 5-10 and TM 5-280). The truck cranes of the engineer battalion may also be used to help in loading.

174. ENGINEER WORK ON ROADS

a. Engineer Reconnaissance. Engineers make a detailed route reconnaissance before major motor marches. It is particularly important to determine the load capacities of bridges and roads, and to estimate the density and speed of traffic that the roads can carry without undue wear and tear. Basing his decisions on this information, the division engineer recommends routes to be followed and maximum speeds to which both tracked and wheeled vehicles should be restricted. When applicable, he also estimates the time and work required to put the route in proper condition. In administrative moves, however, tracked vehicles are usually moved by rail.

b. Engineer Work. Engineer work to put roads in condition for a troop movement is completed before the move starts. Such work consists of strengthening bridges and making minor repairs to road surfaces. Routes are chosen which eliminate the need for construction or extensive repair.

c. Engineers With Advance Elements. Enough engineer troops accompany advance elements of the force to do whatever work is necessary to meet contingencies while on the march. Engineer troops are also located in the march column or columns to be readily available for work beyond the capacity

of the engineers of the advanced elements, and to do any maintenance work which becomes necessary as the force advances.

175. ENGINEER WORK AT DESTINATION

Troops moving on foot, by truck, or by tank should be able to move their organic and attached transportation off the road and into their bivouac area without halting. To make this possible, engineers may have to construct temporary crossings over roadside ditches and gullies, improve secondary roads and trails, and clear new trails. Engineer work at detrainig points is similar to that at entraining points.

176. MOVEMENT BY COMBAT TEAMS

The engineer company comprising the engineer elements of a regimental combat team (RCT) is normally adequate to support the movement of the team. Squads and platoons of the engineer company may be further attached to elements of the combat team in accordance with the plans of the RCT commander. In unusual cases where excessive engineer work is required the division engineer may take responsibility for all engineer work in rear of the combat team, to permit the RCT commander to concentrate his engineer effort in advance of his route of march.

177. TRAFFIC CIRCULATION

The engineers help in traffic circulation by road and bridge reconnaissance, reports and recommendations based on this reconnaissance, supply of road

maps and overlays and by supply and posting of signs and markers in conjunction with the military police as directed by the division commander.

a. Road and Bridge Reconnaissance. The engineer road and bridge reconnaissance is conducted in general accord with the principles discussed in FM 5-10. Since the time available for reconnaissance is usually limited, priority is given to the collection of essential information. This information must be accurate and kept up-to-date. It includes—

- (1) Map or sketch of road net, including detours and alternate routes available.
- (2) Physical characteristics of roads, including type of surface, conditions, road width, and number of lanes.
- (3) Location, type, and characteristics of limiting roadway surfaces, such as bridges, underpasses, steep grades, and one-way defiles. Information on such features includes load capacity, width, condition of approach, vertical clearance, and limitations on speed and distance between vehicles.
- (4) Mileage between important road intersections.
- (5) Location and characteristics of facilities for turning, parking, and halting.
- (6) Sections of important roads where engineer help is or may be required because of difficult operating conditions.

b. Engineer Recommendations. The road and bridge data obtained from the engineer reconnaissance are applied directly, by the use of symbols, to a large-scale map or overlay of the area concerned,

and submitted to G4 with the engineer reconnaissance report. Included in the report are recommendations for the protection of the road net from abuses such as excessive speeds, overloading of roads and bridges, heavy and continuous traffic on roads with poor surface or subgrades, and use of roads in need of repair. The division engineer recommends a traffic circulation plan consistent with the engineer limitations of the road net and the availability of engineer troops.

c. Supply of Maps and Overlays. The supply of road maps is a function of the engineers. Allotments to units, individuals, and vehicles are established by G2. Overlays or maps required for traffic control are prepared by the engineers as requested by G4.

d. Supply and Posting of Road Signs and Markers. The supply and posting of road signs and route markers in traffic operations is a responsibility of the engineers. The determination of the need for such signs and markers is a responsibility of the assistant G4 who coordinates the plans of the division engineer, and the provost marshal. Signs are supplied to identify places, mark routes, state traffic regulations, and warn of special road conditions. See FM 5-10 for proper sizes and locations for traffic signs.

178. BATTALION MOVEMENT

a. General. In administrative movements the engineer battalion usually moves as a unit forming an integral part of the division except for detachments

required per paragraph 170 above. A move may be by motor, rail, water, or air. For long moves, it packs and stencils its own equipment in accordance with current directives. For motor and rail movement it also loads its own equipment.

b. Motor March. The battalion is completely mobile in its organic transportation. Routine motor marches will normally be covered by a battalion SOP, with such items as routes, initial points, order of march, speed, and destination specified separately for each move (see FM 25-10).

c. Rail Movement. In training and preparation for movement by rail the engineer battalion should become familiar with packing, boxing, and crating of organic equipment and the loading of equipment and personnel on railway cars. A battalion rail-movement table and rail movement annex to the SOP should be prepared and kept up-to-date. Detailed information on rail movements, types, characteristics and capacities of railway cars, loading plans, and loading scales and tables are found in FM's 100-5, 100-10, 5-35, and 101-10 and TM 55-525.

d. Air Movement. The prime consideration in loading the engineer battalion for air movement is the anticipated employment in the airhead or at the destination. Troops can best be controlled during the operation and after arrival at the landing area if unit integrity is maintained. Key personnel and equipment should be distributed throughout the airlift to minimize the effect of losses. Equipment too heavy or too bulky to be air-transportable must either be disassembled for movement and then accompany the follow-up echelon to the destination; or be

turned-in to the appropriate depot. Prior to emplaning, troops are instructed in the loading and lashing of equipment, in safety regulations on airstrips and in flight, and in the plan of assembly after landing. The battalion rail movement table, with a few alterations, may be used in compiling an air movement table. For further details of movement by air see FM's 100-5, 100-10, 101-10, 57-30, and TM 71-210.

e. Water Movement. Water movement requires special packing, crating, and marking of equipment, and additional training of personnel. Destination, mission, type of operation, anticipated employment on disembarking, available shipping space and type of vessel are factors which determine whether the unit will be combat loaded, unit loaded, or convoy loaded. The same data, as contained in the battalion rail movement table, but in a slightly different form, can be used for the unit personnel and tonnage table in preparation for movement by water. For additional information on water movements see FM's 100-5, 100-10, 101-10, 31-5, and SR 55-720.1.

Section IV. TACTICAL MOVEMENTS

179. GENERAL

A march in a combat zone is a tactical march when the column will be employed against the enemy upon making contact, or when interference from the enemy is a possibility. The mission of the column, proximity of hostile ground forces, terrain over which the column will travel, types of enemy resistance expected, and activity of hostile air forces are all pri-

mary factors that will determine the organization and composition of the column in a tactical march. Divisional movement orders are prepared by G3 in coordination with other staff officers, particularly with G4 for the selection of routes and for movements requiring transportation in addition to organic transportation. Divisional units, including the engineer battalion, should maintain tables showing road space requirements for their units based on actual strength and material on hand. However, these basic figures may be greatly increased or decreased under extremes of variable factors such as; weather, road conditions, and hostile air and mechanized threats. Basic road spaces for both foot troops and motor elements are shown in FM 101-10. For example: the basic road space for the engineer battalion of 970 men, marching in a column of twos, is 970×1.5 yards per man or 1,455 yards. A mixed motor column of 185 vehicles \times 10 yards each (average) gives roughly 1,850 yards road space for the engineer battalion.

180. DIVISION MOTOR MOVEMENT

On a motor march the infantry division may either move in one trip by use of attached transportation, or by echelon. Motor movement by echelon is a movement of the infantry division which, lacking sufficient organic transportation to move all its personnel and equipment in one trip, uses its transportation to move portions of its foot troops and essential supplies (by complete tactical units) in successive trips until the movement of all has been completed. Normally the move is made in two echelons of two or three serials each. Each serial is usually composed

of a combat team, with separate serials for division troops and division trains. Necessary trucks in the first echelon return to assist in moving the second echelon. Security for the move is normally furnished by the reconnaissance company by reconnoitering to the front and flanks. See FM 101-10 for road space, time lengths, march graphs, march tables, and divisional motor movement SOP.

181. BATTALION PARTICIPATION

The engineer battalion participating in an infantry division tactical march will normally have two of its combat companies, with one or more bridge loads and one tank dozer attached to each, supporting the two leading regimental combat teams. A third engineer combat company supports the third regimental combat team. The remainder of the battalion is kept well forward in the column for support of the forward units, and normally marches with the division troops-serial. The battalion normally is required to furnish trucks to assist in the movement of foot troops in both echelons. The additional trucks used in the first echelon are returned to the battalion to pick up their basic loads in the second echelon. The battalion (less vehicles in the field trains, advance party, and reconnaissance party) occupies a road space of about 3.6 miles in a close column and 10.6 miles in an open column. It has a time length of about 22 minutes in a close column at a speed of 10 miles per hour and 43 minutes in an open column at a speed of 15 miles per hour. On long motor marches, the division commander sometimes forms a "heavy serial" composed of the heavy, slow-moving

equipment and vehicles from units throughout the division.

Section V. THE ADVANCE AND ATTACK

182. GENERAL

a. For the advance, an engineer combat company, with one or more bridge loads and one tank dozer attached, normally accompanies each of the regimental combat teams. In the attack, an engineer combat company is normally placed in support of each committed infantry regiment. Bridge equipment, tank dozers, and other special equipment are attached as needed to the engineer combat company. The normal supporting engineer combat company maintains liaison as needed with an infantry regiment not committed. The same engineer combat company normally supports or is attached each time to the same infantry regiment. The remainder of the battalion performs general engineer support missions and is prepared to reinforce the leading elements with troops, equipment, and supplies (fig. 38).

b. If the situation is such that the engineer battalion is unable to perform all the engineer tasks required, the division commander may request reinforcement. In this case, additional engineer units are placed in support of the division engineer battalion by corps or army.

c. At times, nondivisional engineer units may be attached to the division or to the division engineer battalion to accomplish a specific mission or missions. For example, an engineer company of a corps unit

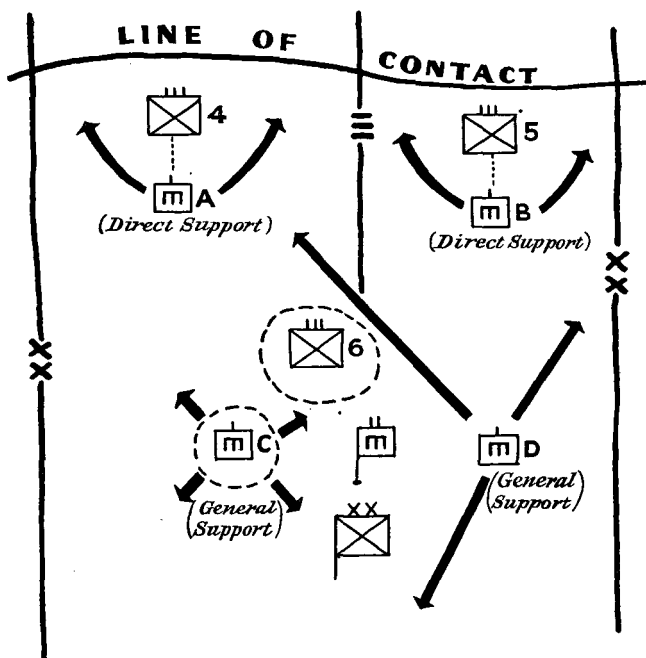


Figure 38. Typical disposition of the engineer combat battalion divisional, in support of the division in the attack.

may be attached to the infantry division for a certain river-crossing operation. At the conclusion of the operation, the company is relieved from attachment and returned to the control of its parent unit.

d. Except for special operations, it is normally desirable for corps engineer units, under parent unit control, to support the division on an area-assigned basis. Boundaries between the divisional and corps engineer units may be established informally to denote the forward working limit of the supporting engineer unit. Such working limits also serve to

eliminate unnecessary concentration of nondivisional troops in forward areas. Specific missions like bridge- or road-building or maintenance forward of a work limit are made task assignments.

e. Regardless of the seniority of supporting engineer unit commanders, the commander of the division engineer battalion remains the division engineer and directs the engineer work in the division area through liaison with the supporting units or through recommendations to the division commander.

183. PHASES OF ATTACK

The attack has two phases: the advance when contact with the enemy is imminent, and the attack proper.

184. ENGINEER MISSIONS

a. The engineer missions in both phases of the attack are relatively the same. However, during the advance more emphasis is placed on "off the road" parking facilities, bivouacs, and camouflage (fig. 39). Reconnaissance in the advance is of a broad scope, overall in nature. In the attack it is more detailed and continuous, and is conducted, in part, by all commanders concerned.

b. In general, the mission is to keep the attack going. The mission may be considered threefold:

- (1) Assisting the movement of infantry and supporting arms.
- (2) Assisting the troops protecting the flanks by creating obstacles in roads and other possible avenues of approach to the flanks.
- (3) Performing general engineer tasks.



Figure 39. Vehicles and field kitchen being camouflaged in France.

185. CONTROL OF ENGINEER EFFORT

a. Disposition of Engineer Troops. The division engineer recommends the disposition of engineer troops for each division operation. Such disposition is normally made by placing engineers in support of other elements or, in some cases, attaching engineers to RTC's or flank security elements. See section XV, chapter 2 for company employment.

b. Responsibility for Control. The division engineer is always responsible for the technical supervision of his troops. He maintains liaison with the advanced elements to assure that maximum value is obtained for the engineer effort expended. During the attack he may place one of the engineer battalion staff officers with an infantry regimental headquarters to act as the unit engineer. This releases the engineer unit commander and the executive officer from any staff responsibilities and enables the former to concentrate on his unit operations. The engineer unit commander retains control and command of the engineer element, but must suit his plans and troop employment to the plans of the supported unit or units.

c. Liaison.

- (1) Liaison between supporting and supported units and between adjacent units must be maintained during the attack to assure cooperation and coordination between all units participating in the operation. Liaison is usually established and maintained by the supporting unit with the supported unit. Liaison between adjacent units is established as directed by the senior commander:

usually each unit is charged with maintaining liaison with the unit to its right.

- (2) The assistant division engineer is the chief liaison agent between the engineer battalion and division headquarters. Similarly, liaison functions between the supporting engineer company and an infantry regiment are performed by the company executive officer except where an engineer battalion staff officer has been assigned to act as unit engineer of supported troops. The liaison officer must be familiar with the capabilities and operations of both units, and keep himself completely informed of all plans and operations in order to give reliable, up-to-date information and advice to both commanders. If a further breakdown of engineer elements becomes necessary, they too must establish and maintain liaison with their supported units.

186. TYPICAL ENGINEER DUTIES

Engineer duties in the attack include—

- a.* Conducting reconnaissance.
- b.* Opening and improving roads, trails, and bridges for troop movement, supply, and evacuation.
- c.* Assisting in preparation of traffic circulation plans.
- d.* Assisting forward movement of infantry and supporting arms by repairing roads, constructing short-span bridges, and removing obstacles.
- e.* Locating, marking, and removing mines (fig. 40).

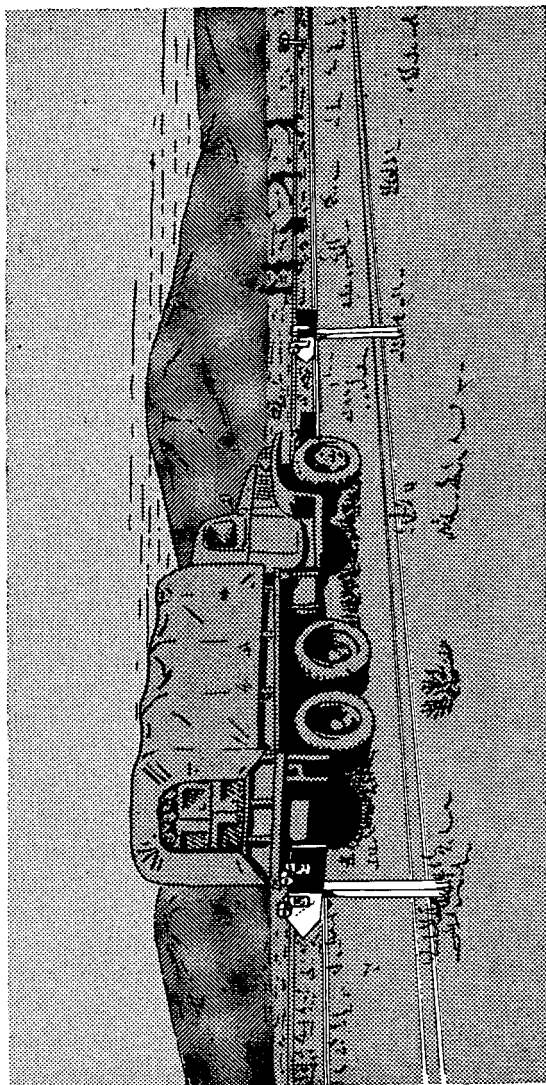


Figure 40. Engineers make and clearly mark lanes through mine fields.

f. Assisting in flank security through use of demolitions, mine fields, and obstacles.

g. Constructing advanced landing strips for liaison-type planes.

h. Such general duties as supply of engineer materials, water, and maps which are continuous and normal duties of headquarters and headquarters and service company.

187. ENGINEER RECONNAISSANCE

a. Engineer reconnaissance in the advance, prior to contact, is performed initially by reconnaissance teams from battalion headquarters who, for the advance, normally accompany elements of the division reconnaissance company. These teams provide the division engineer with early, reliable engineer information in the area over which the division is to advance. Routes of advance are thoroughly examined for serviceability, type, condition, location of critical points, alternate routes, mines, condition and types of bridges, an estimate of engineer work to be done and of engineer materials available. This on-the-ground reconnaissance must be supplemented by air reconnaissance, map and aerial photograph studies, and study of reconnaissance from other elements of command. It is essential that this reconnaissance be made prior to the movement, since the information gained provides a basis for the estimate of engineer troops, supplies, and equipment necessary to support the operation and for the selection of routes and the formation of traffic circulation plans. Engineer reconnaissance elements from the attached engineer company accompany the advance guard of each regi-

mental combat team to provide the unit engineer with timely warning of engineer requirements to the front. Terrain characteristics which appear favorable to the advance are closely examined, especially for possible enemy use of mines, obstacles, and defending weapons.

b. Engineer reconnaissance in the attack, as in the advance, must be thorough and detailed. On the ground, personal reconnaissance is made by commanders and is supplemented by study of maps, aerial photographs, and air and ground reconnaissance reports. Engineer combat companies supporting the committed infantry regiments make continuous reconnaissance of the routes of advance, particularly the main supply route (MSR), the bridges, obstacles, mines, and sources of engineer materials in their assigned areas. Engineer battalion reconnaissance teams continue their general reconnaissance effort following closely the forward engineer companies and paying careful attention to the routes of advance, the MSR and lateral roads, bridges, obstacles, engineer materials, and sites for new water points. Special reconnaissance missions are assigned by the battalion S2 as required. On the basis of this reconnaissance information, engineer operational plans are made, and means provided to assist in keeping the attack going.

188. ENGINEER WORK DONE BY OTHER ARMS

Because there are seldom enough engineer troops available to do all the engineer work necessary to assist the advance of the infantry and supporting arms, the other troops do as much of this work as

possible in order to help themselves. Infantry troops do much of their own pioneer work, assisted by engineers as required. Infantry may clear passage through wire, and bridge narrow and shallow streams with logs or timber found locally, using such expedients to the maximum degree. Considerable help is given the engineers by both the pioneer and ammunition platoons of the infantry battalion headquarters companies, and the antitank mine platoons of the infantry regimental headquarters companies. The infantry pioneer and ammunition platoon is trained in basic pioneer, carpenter, demolition, and mine-warfare techniques, and has essentially the same equipment as an engineer squad, plus an infantry intrenching set. The infantry antitank mine platoon is trained primarily in mine-warfare techniques and has essentially the same mine-detection and clearing equipment as an engineer company. These troops, plus other nonengineer troops specially trained for the purpose, may remove antitank and antipersonnel mines. There are two tank dozers in each infantry regiment and six in the heavy tank battalion, all of which help in improving routes, making bypasses, and removing hedgerows or rubble blocking the advance.

189. ENGINEERS WITH THE ADVANCE GUARD

a. Each column commander is supported by engineer troops, some of whom are normally assigned to the advance guard. The commander of the engineer element functions as the unit engineer of the advance guard and maintains liaison with the advance guard commander. During the advance of a

regimental combat team, a platoon from the supporting engineer combat company normally forms part of the advance guard.

b. A squad of engineers may travel with the point. If on foot, they have supporting troops, tools, and equipment following on transportation by bounds. The engineers on foot normally have hand tools, mine detectors, and/or probes. They search for and mark or remove mines (fig. 41), and remove all other obstacles within their capabilities. Removal of large obstructions may require additional engineer



Figure 41. Forward engineers searching for mines.

troops and equipment. Such engineer elements are rushed forward from the support or reserve.

c. Engineer battalion reconnaissance parties move with the forward elements of the advance guard to give timely warning of required engineer work to the supported and supporting units, and the engineer battalion headquarters.

d. The remainder of the engineers in the advance guard move with the support or reserve. They are not separated from their tools, transportation, and equipment. The advance guard engineers leave work parties at vital points where need for engineer assistance exists or can be foreseen. These details rejoin their unit on completing their task. The advance guard engineers may thus become depleted and by the end of the march may be strung out at a number of points. It may be necessary, therefore, to renew the strength of the advance guard engineers by substituting a new unit for the original one during the march.

190. INITIAL DUTIES

The initial mission of the engineer battalion includes reconnaissance and preparation of the axial routes of advance. Plans for traffic circulation are furnished, if such control is necessary. The preparation of axial routes may require the rehabilitation of old or construction of new roads, trails, and bridges, suitable for the wheeled and track-laying vehicles of the division and the 50-ton loads present also in the infantry division. Consequently, the magnitude of the engineer effort may vary considerably. Pioneer work on advanced landing strips for

army aircraft is performed in conjunction with all divisional air sections to insure close air liaison and reconnaissance support.

191. FLANK SECURITY

The division engineers play a vital role in flank security by placing demolitions and mines and constructing obstacles to prevent enemy interference against the division flanks. Flank security measures depend on such factors as—

- a.* Extent of flank exposed.
- b.* Proximity of adjacent friendly troops.
- c.* Type of terrain over which the attack is moving.
- d.* Reinforcing or reserve units available.
- e.* Natural obstacles.
- f.* Strength and morale of enemy forces.
- g.* Mobility of friendly and enemy forces.

192. MEASURES TO STOP ENEMY ADVANCE

Engineers in the flank guard elements help stop the advance of enemy forces by creating obstacles, road blocks, and antitank and antipersonnel mine fields, and by improving natural barriers. Since troops of all arms can create obstacles, and do so under normal conditions, engineers are used to construct the more complicated types. Obstacles prepared on the flank are integrated into the defensive plans of the commander of the flank covering force and covered by weapons of the covering force.

193. USE OF SMOKE

a. General. Smoke is sometimes used by engineers to mask operations and reduce casualties when work-

ing in view of the enemy and under conditions which prevent surprise. The smoke is laid either as a screen between the work site and the enemy or on the enemy front-line and observation posts. Under some conditions of wind and weather it is possible for engineer troops to lay and maintain an effective smoke screen by using smoke pots and grenades, available through chemical channels. Smoke is normally obtained through the division chemical officer who plans the smoke mission, makes sufficient smoke available through the use of chemical troops with smoke generators, or places smoke on the enemy by use of chemical mortars and field artillery. He may also arrange for smoke operations by aircraft. The use of smoke must be planned carefully to prevent interference with operations of friendly troops. Close coordination with adjacent units must be maintained when smoke is to be used. Smoke skillfully employed can aid in some engineer operations, but its promiscuous and ill-planned use can be a hindrance. It should be used over large areas, since small concentrations usually draw enemy fire.

b. Employment.

- (1) Smoke may be used to mask engineer operations such as; bridge building, river crossing, demolitions, and obstacle clearance to include breaching of mine fields. It may also be used to blanket supporting fortifications or strong points while the supported fortification is being reduced.
- (2) When the engineers are employed as infantry, they may use smoke to screen their own movement, blind hostile observation, and to

disorganize enemy attacks. Colored smoke is used to indicate targets and to mark front lines for supporting artillery or tactical air-force units.

c. *For Additional Information* on the use and source of smoke see FM's 3-5 and 3-50.

Section VI. PURSUIT

194. GENERAL

The pursuit is launched when the enemy is no longer able to maintain his position and endeavors to escape. The commander of the attacking force utilizes all means to maintain the continuity of the attack and to exert a relentless pressure on the defeated enemy. The pursuit is conducted on a broad front with continuous direct pressure against the retreating forces, combined with an enveloping or encircling maneuver to place troops across the enemy's line of retreat. The object of the pursuit is the annihilation of the hostile forces.

195. COMPOSITION

The pursuing force is composed mainly of mobile infantry elements, reinforced by engineers, artillery, armor, combat aviation, and perhaps airborne troops. It is characterized by boldness, determination, speed, mobility, fire power, and coordination of the combined arms team.

196. EMPLOYMENT OF ENGINEERS

The size of the supporting engineer unit depends on the size of the pursuing force and the anticipated

engineer work during the operation. Normally, engineer units are placed well-forward in the columns to facilitate rapid stream crossing and removal of mines and other obstacles. Since greater speed and distance are immediate factors during a pursuit, engineer units are normally attached to, rather than in support of, the major pursuing force (fig. 42).

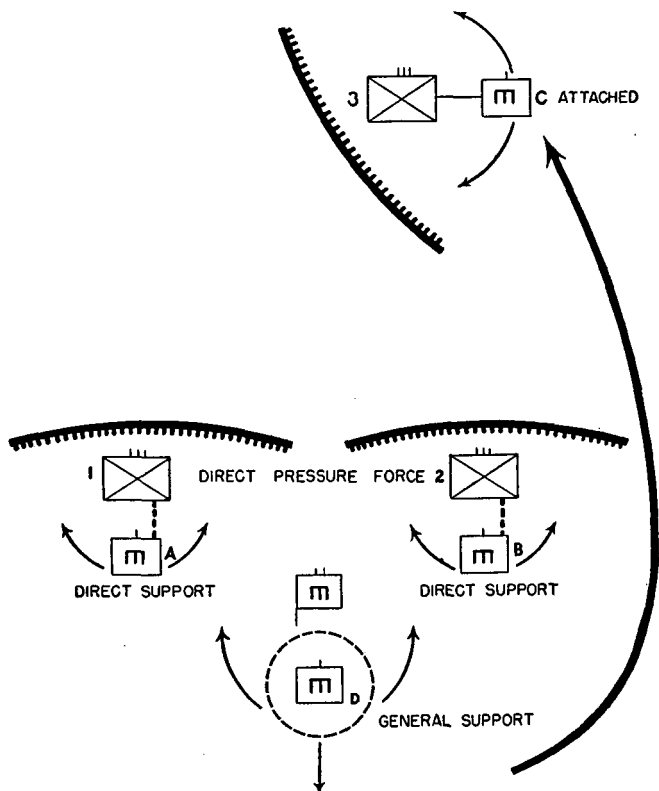


Figure 42. Typical disposition of the engineer combat battalion, divisional, in support of the division in pursuit.

197. DUTIES OF THE ENGINEERS

Since the pursuit is essentially an attack, the mission, employment, and duties of the engineers remain generally the same as in the attack and are discussed earlier in this section. Pursuit is further discussed in FM's 7-10, 7-20, 7-35, and 100-5.

Section VII. THE DEFENSE

198. ENGINEER ROLE IN THE DEFENSE

a. General. This section describes the nature and extent of the activities of the engineer combat battalion, divisional, in support of the infantry division in a defensive situation. It includes activities pertaining to the construction of defensive positions and the supply of engineer materials for fortifications.

b. Employment of Engineers. In the defense, the four combat companies normally remain under control of the division engineer for flexibility of engineer effort in support of the entire division. Engineer work is conducted by giving the engineer elements area or task assignments, with additional troops and equipment available on request from battalion headquarters (fig. 43).

c. Engineer Functions. In general, defensive positions are laid out and constructed by the troops which are to occupy them. However, engineers are used extensively in performing such duties as—

- (1) Conducting reconnaissance.
- (2) Repairing, maintaining, and improving roads for supply and evacuation, and recommending traffic circulation plans.

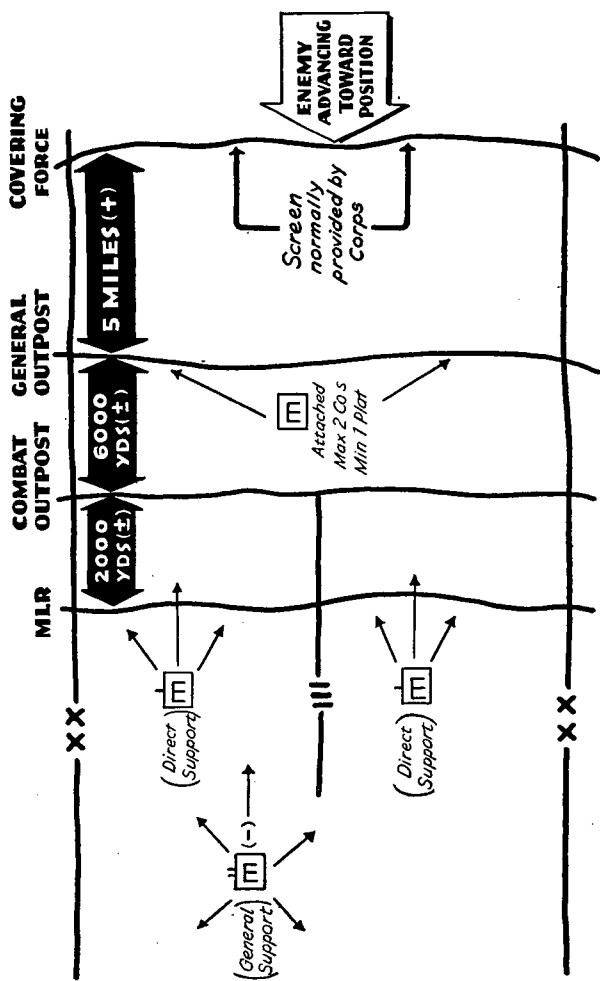


Figure 43. Typical disposition of the engineer combat battalion, divisional, in support of the division in defense. Division as part of a corps in the defense.

- (3) Assisting in field works by providing engineer technicians, mechanical equipment, power tools, engineer materials, engineer technical advice, and similar help.
- (4) Constructing command and observation posts, and obstacles of all types.
- (5) Assisting in flank and rear-area security through use of demolitions and obstructions.
- (6) Providing water supply facilities.
- (7) Providing camouflage materials and aiding in their use.
- (8) Obtaining and supplying maps.
- (9) Participating in combat as infantry.

199. ENGINEER SUPPLY

a. General. The division engineer, through his engineer battalion supply officer, is responsible for supplying field fortification materials to all divisional and attached troops. In a deliberate defensive operation, the amount of materials required for field fortifications is normally so great that transportation is furnished from all troop units employed on the work or from supporting truck units. Principal materials supplied include sandbags, pickets, barbed wire, timber, chicken wire, camouflage nets and garrisoning materials, steel bars, cement, and aggregate. Quantities of materials can be estimated by using data given in FM 5-34.

b. Hasty Defense. Since the hasty defense is a relatively simple system of individual foxholes, gun emplacements, and obstacles constructed under fire or the threat of immediate attack, speed in preparation is essential.

- (1) *Tools.* Infantry units carry their own intrenching equipment sets which are used extensively and are supplemented by hand tools carried by the engineers. Tank dozers are also used, particularly in preparing hasty artillery emplacements and hull-down emplacements for tanks.
- (2) *Materials.* When an attack may be expected before the hasty organization is completed, distributing points or stock piles for fortification materials are located for the infantry units far enough to the rear so enemy infantry fire in front of the main line of resistance cannot prevent their use. However, they should be close enough to the defense line to reduce transportation problems. It is desirable to have a defiladed and concealed distributing point or stock pile for each front-line infantry battalion. In addition to the stock piles provided for the main battle position, one or more distributing points may be provided for fortification materials to be used on the flanks or on defensive areas behind the battle position. These distributing points should be well to the rear in concealed locations accessible to trucks at all times.

c. Deliberate Defense. In a deliberate defense, the supply of fortification materials is planned and regulated by the division engineer and executed by the battalion S4. Special tools and heavy equipment, in addition to that in the engineer battalion, may be obtained from corps and army engineer units

or from class IV depots. Fortification materials are brought up by the unit which is to use them or by supporting truck units, and dumped on the position as needed. To insure economical use and distribution of materials, a simple system of property accounting is set up. Trucks bringing up materials are normally routed through a distributing point which acts as a dispatching station. Such truck movements are planned to avoid traffic congestion and unnecessary trucking.

200. OPERATIONS WITH COVERING FORCES

Normally, the covering force of a defensive position is provided by corps and under corps control, while the general outposts are furnished by the division. When the division puts out such an advance force it is characterized by fire power and mobility, and is a team of combined arms, including elements of the division engineer battalion. Since the mission of both the covering force and the general outpost is to delay, harass, disorganize, and deceive the enemy, the duties of the supporting engineers are the same as in the delaying action. See paragraph 220.

201. ORGANIZATION OF THE BATTLE POSITION AND THE GENERAL OUTPOST

a. General. Each unit commander assigned a sector to defend; makes plans, with the help of his unit engineer, for the organization of his battle position, general outpost, and combat outpost. His plans are based on the plan of the next higher echelon, on thorough reconnaissance, and on the

troops and weapons available. Outposts and strong points are planned, taking advantage of special terrain features and avenues of approach. The troops who are to occupy the positions do most of the work in preparing their defenses, but are aided by the engineers. Special emphasis is placed on correct use of natural concealment and good fields of fire.

b. Battle Position. The main battle position is a zone of resistance consisting of a number of mutually supporting defense areas disposed irregularly in width and depth, each organized for all-around defense with trenches, foxholes, obstacles, and emplacements. Tactical unity is maintained in each defensive area.

- (1) The unit commander of the occupying troops, with the advice of the unit engineer, specifies the type of fortifications to be used and the priority of construction. In constructing deliberate positions, precautions are taken to withhold from the enemy the location of the principal defensive elements. Communication trenches are limited to areas where terrain features conceal them. Dummy and decoy positions may be constructed for deception. Weapons emplacements and troop shelters must fit the terrain and the means available. They must give as complete protection as the time, troops, and materials available permit. Local materials and expedient construction are used where conditions restrict normal construction and supply pro-

cedure. Construction work to strengthen the position is continued during the entire period of occupancy. For prescribed types of fortifications, see FM 5-15. Duties of the engineers are discussed earlier in this section.

- (2) Construction priority provides for efficient use of available time, personnel, tools, and materials. It insures that maximum value is derived from the time and labor already expended, if the position is attacked before construction is completed. Camouflage and the preparation of decoys normally proceed concurrently with other work if the tactical situation permits. In organizing deliberate positions, construction features which are not high priority within the defense may be carried on after contact is made with the enemy or may even be deferred until other more easily concealed works are finished. For suggested priorities of construction work, see FM 101-10.

c. Obstacles and Barriers are used extensively in a defensive situation. Full advantage is taken of such natural obstacles as rivers and gullies. Normally, the use of artificial obstacles is limited by the time, labor, and materials required for construction. The most satisfactory method of creating an obstacle in ordinary terrain is by demolition of bridges over unfordable streams. Bridges are prepared for demolition, and either blown on order or to prevent them from falling intact into enemy hands. All "prepared" bridges must be adequately guarded to pre-

vent enemy interference with the explosives (figs. 44 and 45). Road blocks on main road nets in locations difficult to bypass, such as heavy woods, steep sidehill slopes, or swamps, are also satisfactory. For details of demolitions and field fortifications and barriers, see FM 5-25 and FM 5-15 respectively. In open country, mine fields are the most practical obstacles. For a detailed discussion of mine field technique see FM 5-31. Engineer troops are used in preparing the obstacles or may supervise construction if other troops are available for the work. Care must be exercised in planning and siting obstacles, particularly in the rear and flanks of the battle position, not to interfere with the planned commitment of the reserve elements. Obstacles should, whenever possible, be covered by fire to prevent the enemy from

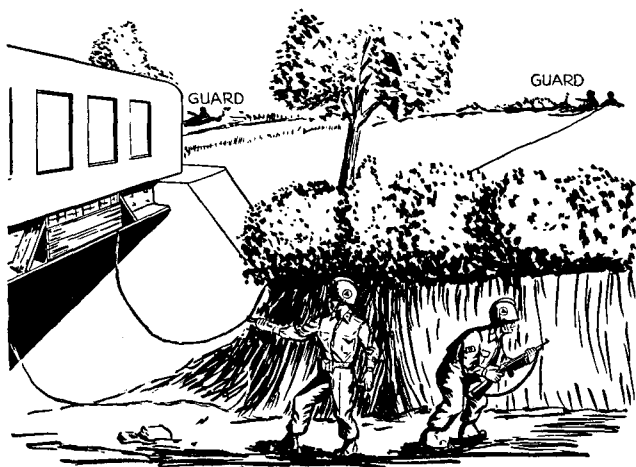


Figure 44. Do not let the enemy approach prepared demolitions unobserved.

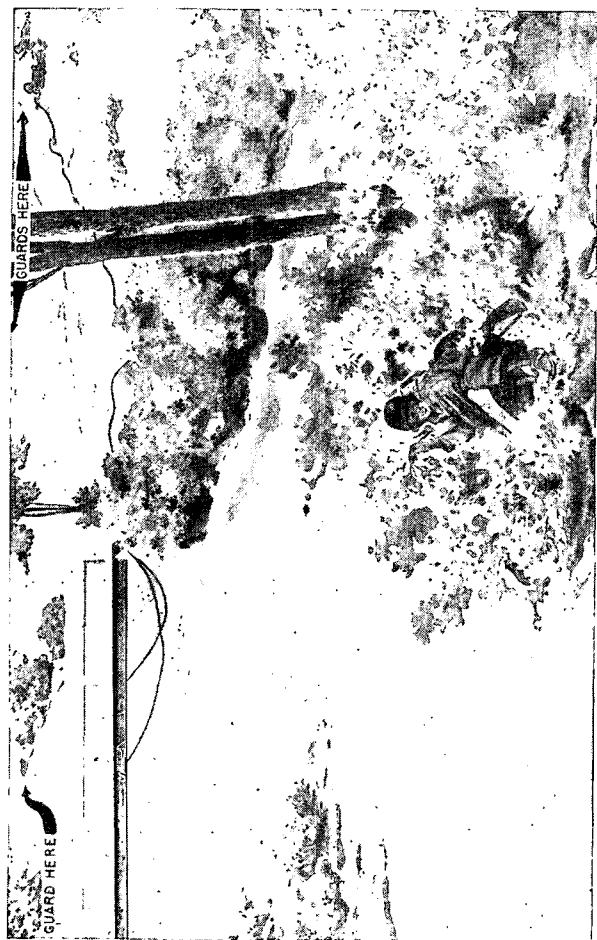


Figure 45. Place guards where they can protect prepared demolitions.

breaching them unmolested. Obstacles are normally defended by infantry or antitank troops. Defended obstacles organized into a coordinated system of successive battle positions form divisional barrier zones in depth.

d. General Outpost.

- (1) The general outpost is set up at least 6,000 yards forward of the main battle position and on dominant terrain. It is manned by a team of combined arms and includes elements of engineers. Its mission is to give timely warning of the approach of the enemy, to deceive him as to the exact location of the main battle position, and to harass and delay him. Maximum use is made of natural and artificial obstacles, mine fields, demolitions, and long-range fire. Duties of the engineer troops with the general outpost are the same as in a delaying action. See paragraph 220.
- (2) In a typical defensive situation, corps assumes the defensive and puts out its covering force well-forward of the main line of resistance (MLR). The infantry division receives its defensive boundaries and puts two infantry regiments on the MLR, each supported by the normally associated engineer combat company. Since infantry doctrine requires one infantry battalion in the general outpost for each infantry regiment on the MLR, the third infantry regiment (less one battalion) supported by light artillery, elements of the reconnaissance com-

pany, and sufficient engineers, forms the general outpost. Units initially composing the division reserve are one battalion of infantry and the division medium tank battalion. When the infantry regiment on the general outpost falls back through the main battle position it is reconstituted as the divisional reserve regiment.

- (3) Normally one engineer company is attached to the general outpost. The engineer company commander then becomes the unit engineer. He advises the general outpost commander on engineer work and assigns missions and areas of responsibility to his three platoons. Each of two platoons is assigned approximately half the general outpost area, corresponding generally to each of the two infantry battalion areas. The third engineer platoon is normally employed in general support of the general outpost line. Each platoon with an area assignment is responsible for keeping open the main withdrawal route within its area, and prepares the obstacles along that route. A small detachment of engineers, normally a noncommissioned officer and a few men, is left at each site. This detachment has specific instructions as to when to effect the obstacle so that it will be accomplished neither too soon nor too late. As additional assurance of proper execution, the engineer platoon leader is responsible for each route, while the time of execution is coordinated

by the company commander. The order to execute the obstacles on each route is normally given by the senior infantry officer of the general outpost withdrawing over that route. Each platoon commander is also responsible for preparation and execution of obstacles on the lateral roads within his respective area. If two engineer companies should be attached to the general outpost, the battalion executive officer would normally be sent forward as the unit engineer to coordinate the engineer effort of the two companies.

- (4) When the general outpost withdraws through the MLR, the engineer elements are relieved from attachment and revert to engineer battalion control.

e. Combat Outposts. The combat outposts cover the foreground of the battle position. They are established along a combat outpost line and located on dominant terrain features usually between 800 and 2,000 yards forward of the MLR. They are far enough forward to deny the enemy close ground observation of the battle position. The mission is to delay and disorganize the advance of the enemy, give timely warning of his approach, and to deceive him as to the true location of the battle position. The division commander normally prescribes the general location, while the regimental commander prescribes strength and composition of the combat outposts. Personnel to man the combat outposts may be drawn from the reserve battalion or from the front-line battalions, depending upon the re-

quirements and the tactical situation. Engineers are not normally a part of the combat outposts, however, when engineer support becomes necessary it is provided by the engineer company supporting each infantry regiment. Duties of the engineers are similar to those of engineers with the general outpost.

202. DIVISION REAR AREA DEFENSIVE POSITIONS

In addition to barriers in depth, from the general outpost through the regimental reserve area, blocking positions are prepared in rear of the regimental reserve area. These blocking positions are planned by the division commander, and prepared by the reserve regiment, assisted by the engineers. Positions are selected and organized to prevent major penetrations, to secure lightly held or exposed flanks, and are occupied by elements of the division reserve, as directed. Full advantage is taken of natural terrain features. Positions are prepared for all-around defense and, where possible, are mutually supporting. Emphasis is placed on defense against armored attack. Defense of division headquarters and rear-area installations is normally prepared and executed by the division headquarters defense platoon, service troops, and reserves, aided by elements of the engineer battalion. Defense against airborne attack is provided by the division mobile reserve.

203. FLANK SECURITY

a. Flank-security measures depend on such factors as—

- (1) Extent of flank exposed.

- (2) Type of terrain in which the defense is set up.
- (3) Reinforcing or reserve units available.
- (4) Natural obstacles.
- (5) Expected employment of enemy forces.
- (6) Mobility of friendly and enemy forces.

b. Lateral security of internal units is maintained by cooperation with adjacent units. Liaison is maintained with neighboring units so the defense commander will keep fully informed of developments in adjacent areas. Maximum use should be made of liaison and reconnaissance aircraft during daytime. If the defending unit has an exposed flank or flanks, reconnaissance troops are used to patrol critical areas and act as contact parties, and may establish observation and listening posts. If the enemy attacks on the flank, the defenders resist in place, while the mobile reserve launches a counter-attack to complete the flank security plan.

c. Engineers have the same duties in flank security as in the defense, including the construction of obstacles, preparation of demolitions, and laying of mine fields. Engineers with the counterattacking reserve units do essentially the same work as in the attack. For additional discussion on the defense see FM's 100-5, 5-15, 7-10, and 7-40.

Section VIII. RADIOLOGICAL DEFENSE

204. GENERAL

a. Injuries to personnel from an atomic bomb can be divided into four general categories—those caused by the blast pressure wave directly; those caused

when buildings are wrecked; those caused by burns, either in the wreckage or from radiant heat; and those caused by nuclear radiation either directly or through residual contamination.

b. Radiological defense is defined as the protective measures taken to minimize personnel and matériel damage from radioactivity and is interpreted to include measures such as—

- (1) Training, organization, and distribution of personnel.
- (2) Preparation and maintenance of fixed and portable structure and equipment.
- (3) Teaching of techniques and procedures including use of detecting equipment, protection or removal of exposed personnel, and decontamination of personnel, equipment, structures, or terrain.

205. COMMAND RESPONSIBILITIES

The radiological defense training of the unit and of the individuals in the unit, and the protection of the unit against radiological hazards, are basic responsibilities of command. Some aspects which may be expected to come up for the consideration of unit commanders are briefly discussed in this section and are more completely covered in DA Pamphlet 20-110.

206. ORGANIZATION STRUCTURE

Many of the problems of radiological defense are similar to those of defense against chemical attack. The functions of the present army organization de-

scribed in FM 21-40 for defense against chemical attack are expanded to include radiological defense. Radiological defense duties, therefore, are performed by unit gas officers and noncommissioned officers assisted by radiological defense monitors. This provides specially trained personnel at all levels to assist and advise commanders in radiological defense planning and action. The personnel required in the radiological defense organizational structure of the battalion, as outlined in DA Pamphlet 20-110, are briefly summarized as follows:

a. Unit Radiological Defense Officer (Unit Gas Officer). S3 is the battalion unit radiological officer. Each company radiological defense officer is appointed by the company commander. Unit commanders appoint a minimum of 1 qualified alternate from assigned officers, making a total of 12 unit radiological defense officers in the engineer combat battalion, divisional.

b. Unit Radiological Defense Noncommissioned Officer (Unit Gas Noncommissioned Officer). The battalion commander appoints one radiological defense noncommissioned officer and at least one alternate in battalion headquarters. Each company commander appoints a minimum of two radiological defense noncommissioned officers and two qualified alternates all of whom are selected from the upper four grades.

c. Radiological Defense Monitors. The battalion commander appoints a minimum of one radiological defense monitor from battalion headquarters; each company commander appoints a minimum of two per company. At least one alternate is appointed

for each monitor required. Monitors are selected from the lower four grades.

207. BEFORE-BURST OPERATIONS

The division engineer is responsible for construction of installations required for radiological defense in the division area. He consults the division radiological defense officer concerning optimum protection to be gained through special types of construction and the location of new shelters, and special command posts. Additional before-burst engineer tasks include to—

a. Survey area for suitable shelters and sheltered areas.

b. Disperse unit personnel, equipment, and supplies consistent with operational practicability.

c. Cover essential equipment and supplies with canvas or other material for protection against contamination.

d. Select alternate sites for water points to utilize, where possible, underground sources.

e. Organize unit medical, rescue, and evacuation teams.

f. Select and prepare, in bridging operations, an alternate bridge site for each bridge needed.

g. Organize a radiological defense warning system.

h. Prepare a radiological defense SOP based on that of the next higher headquarters.

208. AFTER-BURST OPERATIONS

The engineer mission in case of an atomic attack is expected to be essentially the same as for other

types of attack, but complicated in practice by the destructive effects of atomic weapons and the additional hazards of residual radiation. After the burst engineers may be required to—

- a.* Perform first aid, rescue, and evacuation tasks.
- b.* Prepare personnel decontamination stations.
- c.* Monitor unit areas for the extent and intensity of radiological contamination.
- d.* Make and post signs for unsafe areas.
- e.* Decontaminate essential areas or evacuate to safe areas.
- f.* Fight fires.
- g.* Clear debris from essential routes to facilitate relief, supply, and evacuation.
- h.* Produce a maximum of potable water.
- i.* Perform other special and general engineer tasks as required.

209. TRAINING

a. All military personnel receive orientation in radiological defense. Unit radiological defense specialists receive additional indoctrination and training in unit schools or in radiological defense schools conducted at higher levels. Courses of instruction and training phases are described in SR 350-110-10, SR 350-80-1, and DA Pamphlet 20-110. In addition to indoctrination courses required, unit commanders include in troop information programs and similar discussions, frank and open presentations of unclassified atomic energy information to instill in the command the proper respect for this new weapon, and to refute irresponsible and misleading rumors.

b. Medical specialists assigned to the unit receive military technical training in the clinical aspects of radiation injuries in the Army Medical Service Schools and continuously thereafter through medical channels.

Section IX. DEFENSE AGAINST GUERILLA FORCES

210. GENERAL

An area confronted with a serious guerilla menace is as much a combat area as is the front line. Commanders and troops in such an area must maintain the same alert and aggressive attitude as front-line troops. Security measures are taken to safeguard troops, installations, and lines of communication. Vigilant security and sound defensive measures not only minimize our own losses, but tend to discourage guerilla operations.

211. TROOP SECURITY

Troop security is a command responsibility and function. All echelons must be thoroughly briefed on known or suspected hostile guerilla forces. Combat security measures, including extensive patrolling, are employed on the march, during halts, and while in bivouac to minimize losses from guerilla ambushes or attacks. Troops in rear areas may acquire a sense of false security and relax their vigilance even though guerillas threaten them with dangers as great as those in forward areas. Commanders of units that have not experienced or witnessed a guerilla at-

tack must exercise methodical supervision to maintain security discipline. As guerilla operations may be spasmodic, long quiet periods tend to reduce security vigilance.

212. SUPPLY ECONOMY

Supply economy is strictly enforced. It is emphasized to troops and units that supplies lost, traded, or thrown away usually are recovered by the guerillas and used against our forces. Arms and equipment are salvaged from battlefields and from civilians who have collected them.

213. UNIT SECURITY

Unit areas are secured against guerilla attacks and sabotage, with special attention given to the security of arms, ammunition, and other equipment of value to the guerillas. Fields of fire are cleared and hasty field fortifications are constructed and manned by adequate guards supplemented by patrols. Precautions are taken to prevent guards being surprised and overpowered before they can give the alarm. All soldiers, including headquarters and service personnel are trained in antiguerilla tactics and keep their weapons available for instant use. The routine means of securing an area are altered frequently to prevent guerilla forces from obtaining detailed accurate information about the composition and habits of the defense. Natives are not permitted to enter the area and natives residing in the vicinity are carefully screened or evacuated.

214. ENGINEERS WITH CONVOY SECURITY DETACHMENTS

a. Lone vehicles and convoys not capable of providing their own security are grouped and escorted through danger areas by armed security detachments. These detachments are specially organized and trained to protect convoys from hostile guerilla actions and usually contain elements of armor, infantry, and engineers. The size and composition of a detachment varies with the topography, the capabilities of hostile guerilla forces, and the size and composition of the convoy. Traffic through known danger areas is normally controlled by traffic control stations.

b. The combat engineer element is placed well forward in the column to perform such engineer tasks as minor bridge and road repairs, obstacle removal, and detection and removal of mines.

215. UNESCORTED CONVOY OPERATION

When a convoy is not escorted through a danger area by a convoy security detachment, the parent unit organizes its own convoy security. Part of the available troops are placed well forward in the convoy, and a strong detachment is placed in a vehicle or vehicles that follow the main body by about three minutes. Radio contact is established between the two groups if possible. Fairly fast speed is maintained. Defiles are traversed at high speed. Sharp curves, steep grades, or other areas where low speed is necessary, are reconnoitered by foot troops sent

ahead. At the first indication of ambush while the convoy is in motion, leading vehicles, if the road appears clear, increase their speed to the maximum consistent with safety in an effort to run through the ambush area. Drivers or assistant drivers of vehicles disabled by enemy fire or mines seek to direct their vehicles to the sides or off of the roads so as not to block vehicles in rear. Troops from vehicles stopped in the ambush area dismount and return fire. Machine guns mounted on vehicles are fired. Troops from vehicles breaking through the ambush, dismount and attack back against a flank of the ambush position. The rear guard of the convoy, upon learning that the main body has been ambushed, dismounts and attacks forward against the other flank of the ambush position. Both attacking groups take care not to fire on each other. If the guerillas allow the main convoy to pass through and then ambush the rear guard, troops from the main body return and relieve the rear guard by an attack against the flank of the ambush position.

216. SUMMARY

- a.* Hostile guerilla forces are not to be underrated.
- b.* Rear-area, as well as front-line troops must be constantly on the alert for guerilla attack.
- c.* Commanders must emphasize continuous unit security and maintain plans to counter guerilla activity at any and all times. See FM's 31-20 and 31-21.

Section X. RETROGRADE MOVEMENTS

217. GENERAL

A retrograde movement is a movement to the rear or away from the enemy. It may be forced by the enemy or it may be voluntary. Retrograde movements are covered by mobile forces of combined arms, which delay and deceive the enemy, and prevent interference with the execution of the retrograde plan. Contact with the enemy is maintained by these covering forces, who force the enemy to fight or maneuver for the ground that is given up. Retrograde movements are made only by order of, or after approval by, higher headquarters and include withdrawals from action, retirements, and delaying actions.

218. ENGINEER SUPPORT OF OTHER ARMS

During retrograde movements, engineers play a vital role in helping the other arms make the advance of the enemy as difficult as possible. Such assistance may include any or all of the duties outlined in paragraph 217. Proper coordination and execution of engineer tasks in retrograde movements normally requires the attachment of engineer elements to the covering force. The leading elements of the retiring friendly troops must be kept moving to their destination, and the routes kept open and clear to allow successive elements to reach their destinations. Engineers near the tail of the retiring column destroy bridges (fig. 46) and culverts, block roads, lay mines, destroy stores, and demolish railways and rolling stock. The time available determines the degree



Figure 46. A prepared bridge still of value to friendly troops is defended to prevent premature destruction. Proper defense may require troops other than engineers.

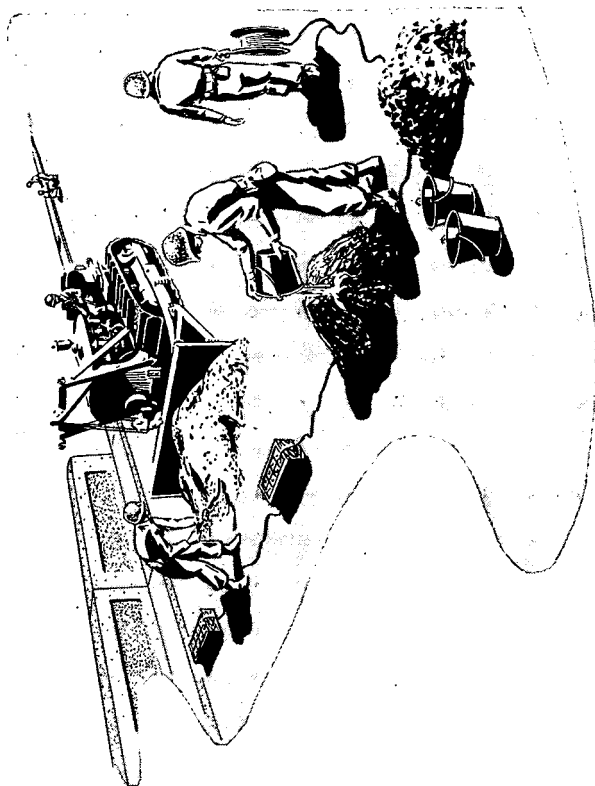


Figure 47. If time is short, speed demolitions by use of heavy equipment and hasty placement tamping of charges.

of destruction and the number of obstacles constructed. Major obstacles must receive priority, since their construction leads to the greatest difficulty for the enemy. The engineers work closely with the other elements of the covering force, preparing alternate delaying positions and obstacles for the infantry and antitank units, while moving to the rear in leap-frog fashion.

219. ENGINEER DUTIES

a. The duties of the engineers in a retrograde movement are basically the same as in the defense. Typical duties include—

- (1) Performing engineer tasks to aid movement of retiring columns.
- (2) Participating in denial operations (see sec. XI below).
- (3) Delaying the enemy by destroying bridges and culverts, blocking roads, demolishing railways, and erecting barriers (fig. 47).
- (4) Assisting in flank security by preparing demolitions and creating obstacles.
- (5) Engaging in combat as infantry.

b. In a retrograde movement, supply trains, including engineer supplies and equipment, are normally among the first elements to move to the rear. However, to meet the needs of engineers with security elements, it is frequently necessary to operate engineer supply points near the front until the last elements withdraw.

220. WITHDRAWAL

a. A withdrawal from action is the operation of breaking off combat with a hostile force by a rearward movement. It may be followed by a retirement, a delaying action, or by the occupation of a rear position or area from which subsequent offensive or defensive action is conducted. A withdrawal is most successful when conducted under cover of darkness.

b. Engineer duties are relatively the same as in retrograde movements, as described in paragraphs 216 and 217 above. (See also FM 100-5 and FM 7-10.)

221. RETIREMENT

a. A retirement is an orderly retrograde movement of troops according to their own plan and without pressure from the enemy. A retirement may be made following a withdrawal from action; or when no actual contact with the enemy has been made. When a withdrawal from action precedes the retirement, the actual retirement begins after the main forces have broken contact with the enemy and when march columns have been formed.

b. Engineer support in a retirement includes—

- (1) Reconnaissance and improvement of the routes of retirement.
- (2) Repair of bridges, culverts, and bypasses.
- (3) Preparation of obstacles and demolitions to be executed by the rear guard.
- (4) Performance of engineer missions with the rear and flank guards.

- (5) In certain situations, the reconnaissance and staking out of rear defensive positions. (See FM 100-5 and FM 7-10.)

222. DELAYING ACTION

a. Delaying action is a form of defensive action on one or more positions used to retard the enemy's advance and to gain time without becoming decisively engaged. This delay is usually obtained by forcing the enemy to breach obstacles, deploy early, and to consume time in preparation for battle.

b. Engineer elements are used in support of the delaying force, or, in a sustained operation, may be attached to subordinate tactical units. They are employed to construct a barrier zone of mines, obstacles, and demolitions in front of the first delaying position and in the area between successive positions. Obstacles are defended by infantry and other non-engineer troops in order to release the engineers for additional engineer work. (See also section VII of this chapter, FM 100-5, and FM 7-10.)

Section XI. DENIAL OPERATIONS

223. GENERAL

a. A denial measure is action to hinder or deny the enemy use of space, personnel or facilities and may include destruction, removal, contamination, or the erection of obstructions. It is a responsibility of all commands. For commanders with area jurisdiction, the responsibility for denial includes everything in the area; for other commanders, unless specifically ordered otherwise, it includes only the material and supplies assigned their units.

b. A scorched-earth policy makes an entire area useless to the enemy by the removal or destruction of everything that can in any way aid him. It is denial carried to the extreme. The civilian population of an area in which the scorched-earth policy is to be applied must be evacuated if the area is friendly. Such evacuation must be strictly controlled to prevent interference with troop movements. A partial-denial operation, less drastic than a scorched-earth policy, is more often employed.

c. The decision as to the extent to which denial operations are to include nonmilitary supplies and facilities is a responsibility of the highest military commander in the theater. When the denial policy is established, the detailed planning and execution involve major problems in engineering and logistics.

224. BATTALION PARTICIPATION

The division commander is responsible for denial operations within his divisional area. His plan for denial of both military and civilian supplies, equipment, and installations is prepared in accordance with denial policy from higher headquarters, and is distributed to divisional units for execution. This is generally a large task, requiring a high degree of technical skill and considerable time for detailed planning, careful preparation, and execution. The division engineer battalion is especially suitable for executing denial operations. Extensive use is made of the engineer equipment and demolitions in removal or destruction of items to be denied to the enemy. Troops of other arms and services are also used extensively in denial operations, usually under

engineer supervision. It is a command decision to determine when preliminary work is to be done and when plans are to be executed. A denial operation to be successful must be prosecuted ruthlessly. The engineer battalion, like other units, normally has an SOP for the destruction of its own supplies and equipment.

225. ITEMS DENIED THE ENEMY

All possible military supplies and equipment are evacuated. The remainder must be destroyed. The division and the engineer battalion are interested mostly in the denial of such items as—

- a.* Military equipment and supplies.
- b.* Military installations.
- c.* Communications facilities.
 - (1) Railroads and rolling stock.
 - (2) Airstrips.
 - (3) Bridges.
 - (4) Highways.
- d.* Signal communication items.
- e.* Certain buildings and structures.

226. DENIAL BY REMOVAL

Evacuation of materials is as much a part of any denial operation as destruction. Evacuation must be started early and conducted in accordance with prepared priority lists. All available means of labor and transportation must be used to capacity in order to save all possible supplies and equipment.

227. DENIAL BY DESTRUCTION

a. All possible methods of destruction are used. The most common are—

- (1) Explosives (see FM 5-25).
- (2) Fire.
- (3) Flooding or drenching.
- (4) Mechanical methods, such as breaking with a sledge hammer or cutting with an oxyacetylene torch.
- (5) Contamination.
- (6) Projectiles—small arms, artillery, and bombs.

b. In order that destruction may be executed at the desired time, the personnel to destroy each item must be designated in advance; the supplies necessary for the destruction must be estimated and assembled at convenient locations; the circumstances under which the destruction is to take place must be definitely prescribed; and, if orders for destruction are to be issued, the means of transmission must be provided.

Section XII. RIVER-CROSSING OPERATIONS

228. GENERAL

a. Information Covered. River-crossing operations are discussed in general in this section. The tactics and technique of the engineer combat battalion divisional in these operations, and in relation to other units, are discussed in more detail. Further essential references for crossing operations are found in FM's 100-5, 31-60, 17-10, and 7-40.

b. Objective and Mission. The immediate objective of the attack on a river line is to get across quickly and economically and establish one or more bridgeheads to protect the crossing of the remainder of the command. A division usually crosses as part of a larger force and has one of the following missions; to force the main crossing, to make a secondary crossing, or to make a feint. The actual crossing is a means, not the end sought.

229. TYPES OF CROSSINGS

Plans for crossing a stream over which the enemy has destroyed all bridges depend on several factors including the strength with which the enemy holds the opposite bank and the characteristics of the river. There are two general types of crossings—a hasty river crossing and a deliberate river crossing.

a. A hasty river crossing must be boldly executed to insure surprise, to prevent the organization of strong defenses, and if possible, to seize an existing bridge or ford. Detailed reconnaissance and planning are secondary to speed. Advanced elements are crossed by expedient means if normal equipment is not available. Such crossings must be foreseen; all available equipment must be utilized promptly. When the opportunity for such a crossing is presented to an advance force, the supporting engineer troops aid in the immediate crossing and exploitation. Bridges, and other crossing means if necessary, are constructed as soon as possible by the division engineers to cross additional divisional troops which are rushed forward to expand the initial successes. Hasty crossings are crossings of opportunity for

which few definite procedures can be established. Therefore, the following paragraphs apply principally to deliberate river crossings.

b. A deliberate river crossing is necessary if the opposite bank is strongly held. Detailed planning, extensive logistical preparation, and air and ground superiority are required. Over-all planning and coordination are performed by higher commands, corps or higher.

230. BASIC STEPS OF A RIVER CROSSING

Reconnaissance, planning, assembling equipment, and designating, and in some cases training, necessary forces usually take place well in advance of the operation. The actual crossing of the assault forces is conducted in four steps—

- a.* Movement forward to assembly areas.
- b.* Movement from assembly areas to attack positions.
- c.* Crossing.
- d.* Attack on far bank to seize successive objectives.

231. FAR-SHORE OBJECTIVES

The force landing on the far bank usually has three successive objectives. The objectives are an integral part of the crossing. The location of the three objectives is determined by the terrain, enemy observation, and fields of fire. It should be recognized that two objectives may coincide in one terrain feature. The objectives are—

- a. First.* The elimination of the enemy's capability to place effective direct fire on the crossing front.

b. Second. The elimination of the enemy's capability to place observed fires on the selected crossing sites.

c. Third. The elimination of the enemy's capability to place any effective sustained fires of ground weapons on the selected crossing sites and on the space required on the enemy's side of the river for maneuver of the command. The third objective normally extends to the corps bridgehead line.

232. CROSSING MEANS

For the execution of the first objective, necessary infantry troops and equipment are crossed in assault boats or storm boats. After the first objective is accomplished footbridges, ferries, and rafts or other crossing means such as cableways and expedient bridges, are constructed. These cross additional personnel, ammunition, heavy weapons, equipment, and armor and other necessary vehicles to support and expand the bridgehead. Construction of fixed or floating bridges is usually started when the second objective is accomplished. Execution of the third objective, coupled with local air supremacy, permits the completion of the bridges; uninterrupted use of the bridges in crossing supporting troops, equipment, and vehicles; accumulation of supplies on the enemy side; and exploitation of successes already attained.

233. AIRBORNE TROOPS

Airborne troops may aid in the attack on a river line. Their prime objective is to seize, occupy, and defend terrain, probably on the corps bridgehead

line, as an integral part of the operation. They may be used to seize bridges by surprise before they can be destroyed, and to disrupt communications or to hinder movement of reserves during the attack. The main attacking force links up with airborne troops according to a prearranged schedule.

234. PLANNING AND RECONNAISSANCE

a. Corps or Army.

- (1) Initial planning for a deliberate crossing is done by corps or army staff well in advance of the operation. Higher-echelon advance planning is necessary to allow the timely allocation of supporting engineer troops and the procurement and distribution of necessary equipment. A study of maps and aerial photographs is made to assign division or corps zones, and to select tentative sites for heavy fixed or floating bridges that will cross reserve troops, armor, artillery, and all succeeding troops.
- (2) An engineer combat group is usually assigned to support one division. To carry out this mission properly, the group is designated early in division planning.
- (3) Tentative sites selected from aerial photographs are checked on the ground. Hydrographic records may give information on probable river conditions during the period in which the crossing is planned. If tactical considerations allow a choice, this information may also prove valuable in determining the time of crossing.

b. Division. To assign objectives and regimental boundaries intelligently and to select principal crossing points, the division staff must know the terrain, the disposition of enemy forces, and the main routes of approach to and from the river. A large amount of the technical portion of this information is obtained by infantry division engineer, and group engineer patrols and reconnaissance parties, both ground and air. Coordination between these patrols and parties, and prompt consolidation and distribution of their findings, are necessary. Division G2 limits reconnaissance, consolidates the reconnaissance reports for the division staff, and distributes the information to units of the division to keep them informed of the general situation.

c. Infantry. Instructions from the division commander to infantry regimental commanders state the mission of each regiment, including its objective or objectives, its zones of action, means allocated for crossing, and its time of crossing. All available information obtained by reconnaissance of the river line, including the location of the most favorable crossing points, is furnished the regimental commander. His staff and subordinate commanders make detailed reconnaissance to obtain the following information:

- (1) Composition and disposition of enemy forces, including location of enemy weapons, defensive works, and undefended or weakly held crossing points.
- (2) Well-defined terrain features suitable as objectives.
- (3) Suitable far-shore assembly areas for subordinate units.

- (4) Road and trail net on enemy side of river.
- (5) Favorable routes of attack through enemy position.
- (6) Suitable observation posts and near-shore positions for supporting weapons.
- (7) Initial assembly areas and routes from them to the attack position.
- (8) Attack positions for units making the initial crossing.

d. Engineer reconnaissance of the stream provides information for technical planning. Information required includes location and condition of roads and trails; location, extent, and types of mine fields; physical characteristics of the river as to depth, width, velocity, evidence of flooding, obstacles such as islands, sandbars, floating ice, and the like, character of bottom, and heights and type of soil of banks; sites for concealment of troops and crossing equipment; available routes from attack positions to the river; locations for equipment parks and engineer bivouac areas; location of natural resources and existing structures; and enemy capabilities of controlled flooding and of waterborne attack. The following desirable characteristics are sought in river-crossing operations:

- (1) *Assault-boat* crossing sites are located, as far as possible, where the stream is narrow, the current moderate, and the banks gently sloping. There must be adequate space for the simultaneous launching of the desired number of boats. Concealment is desirable for the approaches to the launching sites, and for the sites themselves. Frequently,

lanes must be cleared and marked to allow movement of boats.

- (2) *Footbridge* construction is easier if the site provides a small cleared area on the near bank where bays can be assembled; gently sloping banks on the near shore so bays can be carried out and connected in the water; and large trees or other anchorages on both banks for float cables and guy cables.
- (3) *Raft* sites are normally located downstream from bridge sites. They should be close to existing roads at points where the current is moderate and where banks can accommodate two or more rafts without landing stages.
- (4) *Floating-bridge* sites should preferably have the following technical characteristics:
 - (a) Short, easily constructed approach roads to existing road nets on both sides.
 - (b) Moderate current.
 - (c) Firm stream banks that can support abutments.
 - (d) Nearby points where pontons may be launched or floats inflated and launched. Normally, pontons are launched downstream of the bridge site, although where tributary streams exist it may be desirable to float pontons to the bridge from launching sites on the tributary.
 - (e) Turn-arounds for vehicles at unloading points.
 - (f) Large trees or other natural anchorages for anchor cables, when used.

- (g) Small variations in water level. Allowance must be made for changes in water level and velocity of current caused by floods and tides, particularly for their effect on the anchorage required.

e. Coordinated Reconnaissance. After the division plan is completed and zones of action are assigned to infantry regiments and battalions, a detailed coordinating reconnaissance is made by infantry regimental and subordinate commanders and officers of the supporting engineer units. At this time, details are worked out for boat-group assembly areas, assault-boat assignments, foot routes to the stream, battalion and company crossing zones, location of engineer equipment, and time schedules.

235. TACTICAL FORMATION

a. Width of Front.

- (1) Higher authority usually prescribes the division front for a deliberate crossing by boundary lines, specified frontages, or by designating limiting points on the river. The division commander subdivides his zone into regimental areas. An assigned area is one of responsibility. The actual crossing may cover only part of the front, leaving dead areas between units to be cleared up after enough forces have crossed. For this reason, units are crossed in depth to prevent forward units from being cut off by the enemy.
- (2) Within the actual crossing area, the unit is dispersed to present a less favorable target.

Assault boats are arranged so the infantry units cross, land, and deploy with a minimum of confusion. Intervals between boats are at least 20 yards.

- (3) The frontages upon which infantry units normally operate have to be decreased when the units are afloat as shown:

Frontages in yards

<i>Unit</i>	<i>Normal ground operation</i>	<i>Afloat</i>
Platoon-----	200 to 300	60 to 150
Company-----	300 to 1,200	200 to 500
Battalion-----	600 to 2,400	500 to 1,600

b. Order of Crossing. Tactical unity and normal support of infantry units are maintained as far as possible in assigning personnel to crossing means. The order in which units cross is determined by the infantry commander. The width of the stream, enemy capabilities, and the equipment and troops available determine the number of waves crossed. If the necessary means are available and the tactical formation permits, one satisfactory method for crossing an assault battalion is as follows:

In assault boats:

Leading wave: Three rifle platoons of each attacking rifle company (less vehicles) with one 57-mm rifle squad from the weapons platoon attached to each rifle platoon.

Second wave: Remainder of weapons platoon, a detachment of the company headquarters of each attacking rifle company, forward observers from the artillery and the mortar platoon and attachments from the heavy weapons

company (a section each of 75-mm rifles and light machine guns).

Third wave: Heavy weapons company (less detachments and vehicles), first echelon of battalion command post, aid station, and liaison personnel of artillery.

On footbridge, rafts or double assault boats: Battalion reserve, battalion headquarters (less detachments), and medical company (less detachments).

236. ENGINEER TROOPS AND MATERIAL

a. Estimates of engineer troops and material required must be available early in the planning stage of a deliberate crossing so equipment can be procured and properly distributed, combined training can be accomplished, and reconnaissance can be made. Tasks of engineer troops include serving as guides, operating assault boats, assembling and operating rafts, erecting and maintaining bridges, removing mines, constructing approach roads, extending road nets and furnishing support after crossing (usually performed by organic engineers, with one platoon accompanying each assault infantry battalion). A reserve of engineer troops and matériel also must be provided to reinforce the means of crossing at decisive points, to replace losses, and to perform other engineer missions as required. All tasks are specifically assigned to selected units for execution. Responsibility for the accomplishment of these tasks is designated in the engineer plan and operation orders. Additional engineer troops (usually a combat group) and special equipment

for the crossing operation are provided by corps or army.

b. The location of engineer matériel, particularly ponton bridge equipment, must be carefully concealed prior to the crossing. Discovery of its presence may disclose the plans of the commander to the enemy. It forms a remunerative target for both combat aviation and artillery, and should be given protection including antiaircraft defense.

237. CORPS ENGINEER

The corps engineer prepares the corps plan. He makes plans for the supporting troops and equipment well in advance, in sufficient time for the assembling of the crossing equipment and if possible, to allow time for training the troops which are to take part in the crossing. A corps tactical plan is developed and a warning order is issued to the divisions selected to make the crossing.

238. THE DIVISION ENGINEER

The division engineer, within the framework of the corps plan, is responsible for the engineer support of the assault within the division area. His plan includes the distribution of all engineer troops and equipment, both organic and that made available by corps, for operations on the near shore, and for engineer support on the far shore.

239. THE ENGINEER COMBAT GROUP COMMANDER

Engineer support provided by corps is normally an engineer combat group. The group commander,

working under corps control, closely coordinates with the division engineer, keeps abreast of the tactical situation and assists in the engineer planning. He is prepared to make recommendations as to the best sites for the crossing means which he will construct and operate, and as to the ability of his unit to support the proposed tactical plans.

240. LIAISON

Close cooperation and exchange of information in all echelons are essential to a successful river crossing. Continuous liaison is maintained between infantry regiments and the engineer units that provide their crossing means. Continuous liaison is also maintained between the division engineer, the supporting engineer combat group commander, and the corps engineer.

Section XIII. STANDARD RIVER-CROSSING EQUIPAGE

241. ASSAULT BOAT M2

(TM 5-271)

The assault boat M2 (division and corps equipment) is used in crossing assault waves of infantry. The boat weighs 410 pounds, has a useful displacement of 4,000 pounds, and is 5 feet 4 inches wide and 13 feet 4 inches long. In addition to a crew of 3 engineers (fig. 48), the boat safely carries 12 riflemen with individual weapons and equipment. Seven of these boats are carried (nested) on a 2½-ton truck or a 2½-ton pole-type trailer. Two assault boats fastened together stern-to-stern and powered by a 22-horsepower outboard motor, can carry a 2-man

engineer crew plus 22 infantrymen in currents up to 7 feet per second (FPS). In currents of 7 to 9 FPS, the load limits is 2 crewmen and 15 infantrymen.



Figure 48. Assault boat with three-man engineer crew.

242. RECONNAISSANCE BOATS

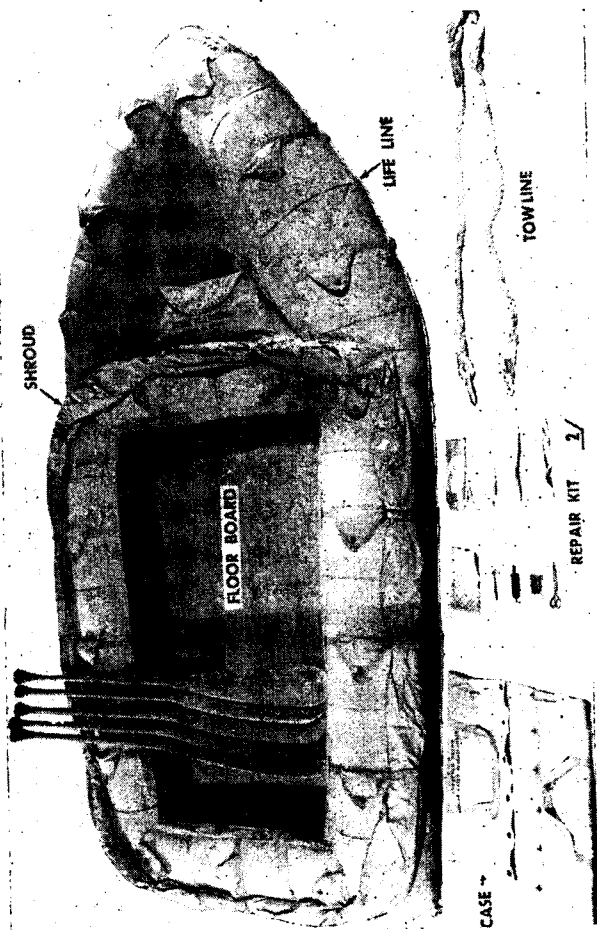
Reconnaissance boats are of two sizes (fig. 49)—

a. The two-man canvas pneumatic reconnaissance boat (TM 5-271) (division and corps equipment), is 7 feet 9 inches and 3 feet 5 inches wide when inflated. It has two folding paddles. When deflated it is



1/

① 2-man



② 5-man

Figure 49. Pneumatic reconnaissance boats.



Figure 50. Storm boat carrying seven infantrymen and a crew of two engineers.

packed in a carrying case 1 foot 9 inches long and 9 inches in diameter.

b. The five-man canvas pneumatic reconnaissance boat (TB 5-271-4) (army depot stock) is 12 feet long and 5 feet 8 inches wide when inflated. Five two-piece paddles are issued with each boat. Rolled and packed in a canvas carrying case, it is 20 inches in diameter and 25 inches long. Its weight when so packed is 120 pounds.

243. STORM BOAT

(TM 5-271)

The storm boat (army depot stock) is used for assaults across wide streams and for crossing where secrecy is subordinate to speed. The boat weighs 450 pounds, is 16 feet 9 inches long and 6 feet 6 inches wide, and has a useful displacement of 2,000 pounds. It is powered by a 4-cylinder, 2-cycle, 55-horsepower outboard motor weighing 200 pounds. Maximum speeds with this motor are 25 to 35 miles per hour, depending on the load. The boat has a crew of two and carries seven riflemen with individual arms and equipment (fig. 50). Four boats are carried (nested) on a two-wheel, pole type trailer. The motors are carried in the bed of the trailer prime mover.

244. FOOTBRIDGE

(TM 5-271)

The footbridge (corps equipment, army depot stock) is a standard means of crossing foot troops

over a stream (fig. 51). The bridge is not affected materially by small-arms fire. One unit of foot-bridge equipment is 432 feet long and is transported on two 2½-ton trucks and two-wheel pole type trailers.



Figure 51. Infantrymen crossing a footbridge.

245. INFANTRY SUPPORT RAFT (TM 5-271)

a. The infantry support raft (corps equipment and army depot stock) is used to ferry vehicles and

troops. The raft consists of M2 assault boats paired to form pontons, together with plywood treadways, siderails, siderail clamps, and guy lines. Rafts of various sizes, using from three to seven pontons, can be constructed. Infantry support rafts are propelled by from one to three 22-horsepower outboard motors. The number of motors used depends on the size of the raft, but one extra motor is always installed as a spare.

b. The usual infantry support raft is constructed of 6 assault boats connected in pairs to form 3 pontons, and 8 plywood treadways. This raft carries a loaded $2\frac{1}{2}$ -ton truck (fig. 52). Infantry support rafts are issued in sets which provide 12 three-ponton rafts.

c. If enough equipment is available, the best all-purpose type of raft is constructed of 10 assault boats (5 pontons), and 5 pairs of treadways. This raft carries a loaded $2\frac{1}{2}$ -ton truck with 105-mm howitzer. When possible, this raft is used in preference to the customary 3-ponton raft.

d. Except over wide rivers or those having unfavorable banks, six five-ponton infantry rafts can ferry a regiment of infantry and its necessary supporting vehicles, except tanks, in 3 to 5 hours.

e. The raft material of 12 three-ponton infantry support rafts can be combined into a ponton bridge 384 feet long with pontons at 10-foot centers (fig. 53). Such a bridge can carry a $2\frac{1}{2}$ -ton truck with 105-mm howitzer.

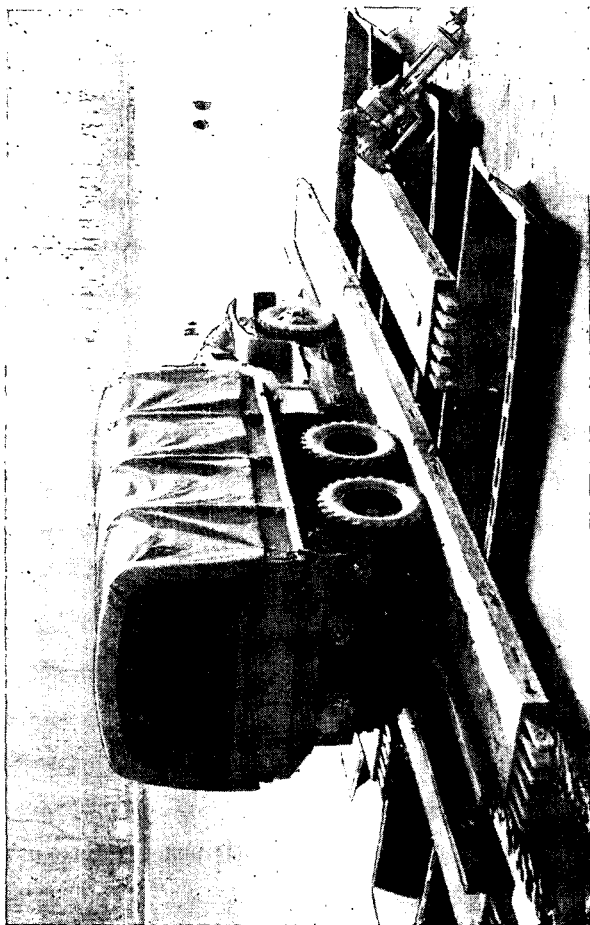


Figure 52. Three-ponton infantry support raft carrying a 2½-ton truck.

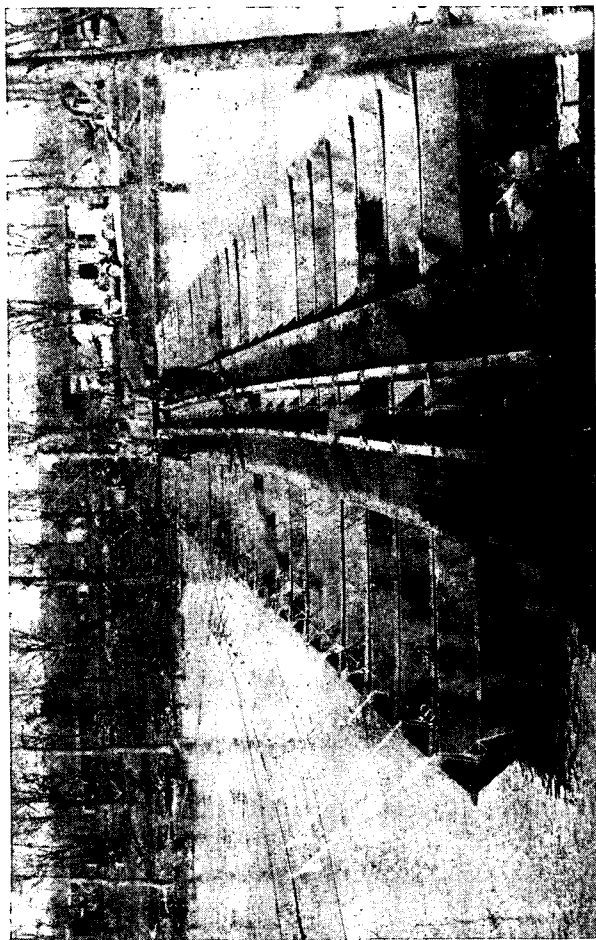


Figure 53. M2 assault boat bridge in Germany.

246. CABLEWAYS

(TM 5-271)

Light and medium cableways (army depot stock) may be used to cross supporting vehicles and weapons when stream or bank conditions make rafting difficult or impossible. When their use is foreseen, they are provided in class IV depots. Their capacity varies from 2,000 pounds over a span of 1,500 feet, to 3,000 pounds over a span of 1,200 feet, depending on whether the light or medium cableway is used. Obviously, their capacity is appreciably less than that of the support rafts.

247. BRIDGE, FLOATING, STEEL, TREADWAY, WIDENED

This bridge (division and corps equipment) combines the equipage of the steel treadway bridge M2, described in TM 5-272, with the plywood treadways of the standard infantry support raft, TM 5-271. The 18-ton pneumatic floats support both steel and plywood treadways rigidly joined end-to-end to form three continuous tracks (fig. 54). When conditions prevent the use of floats, the treadways are supported on 50-ton trestles. When inflated the pneumatic floats are 33 inches in diameter, 33 feet long, and 8 feet 3 inches wide. The steel treadways are 12 feet long and 45½ inches wide. The plywood treadways are 12 feet long and 37 inches wide. One unit of the bridge is 288 feet long. Capacities of fixed bridges are shown in table III; of floating bridges in table V.

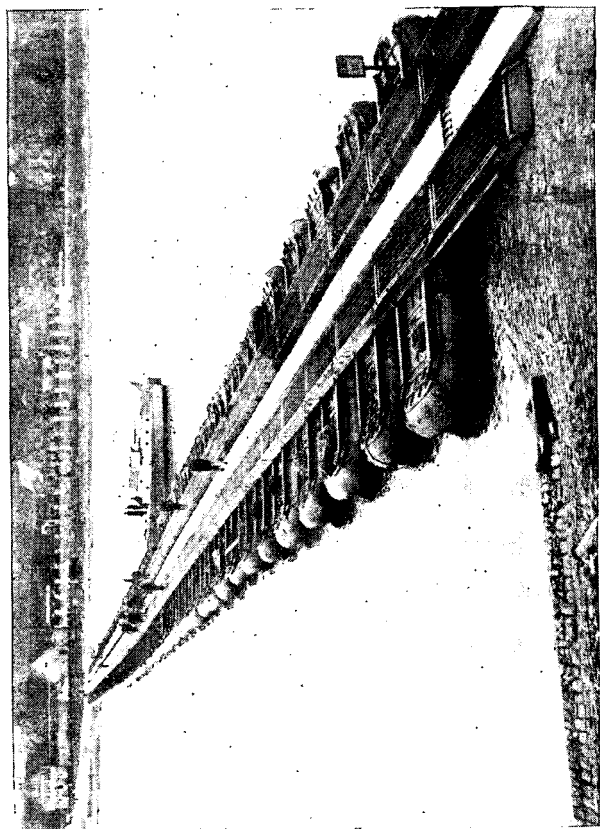


Figure 54. Bridge, floating, trestle, steel, widened.

Table V. Floating Bridges

1	2	3	4	5	6	7	8	Capacity in tons ^a												24		
Type of bridge	Transportation required ^o	Construction time in hours ^b				Construction party ^e	Main- te- nance crew	Safe crossing ^c (posted capacity)	Caution crossing ^f	Risk crossing ^g	Traffic capacity and vehicular distance for safe crossings in daylight (except as otherwise noted) ^h											
		Stream widths									Stream velocities in feet per second											
		150 ft	250 ft	500 ft	1000 ft						3	5	7	9	11	13	15	17	19	21	22	23
Foot-bridge M1938.	1-2½ truck per 144 ft. of bridge.	¼	½	1	2	1 Plat.....	1 Sqd.	Safe..	Un- safe	3	5	7	9	11	13	15	17	19	21	22	23	Day: 75 men per minute Night: 40 men per minute at normal 2-pace distance ⁱ
M2 Assault Boat Bridge	1-2½ truck and 1 pole tr per 36 ft. of bridge.	1	1½	2	2½	1 Plat.....	1 Sqd.	8	6	5	8	6	5	9	7	6						200 vehicles per hour; 90-ft distance between vehicles.
	1-2½ truck and 1 pole tr per 24 ft. of bridge.	1½	2	3		1 Plat.....	1 Sqd.	13	9	7	13	11	8	14	12	9						

5	Widened steel treadway bridge.	1-6t treadway truck per 24 ft. of bridge.	2½	4	7	12	1	tdwy br co plus 1 combat co.	1 Sqd.	50	50	40	30	15	50	45	35	20	55	55	50	45	30
6	M4 bridge.	1-2½t lwb bolster truck per 15 ft. of bridge (normal const).	3	5	8	14	1	ponton br co plus 1 or 2 combat cos.	1 Sqd.	55	55	55	45	30	60	60	50	40	65	65	65	55	45
										95	95	95	70	40	100	100	85	55	105	105	105	100	70
										(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
7	Airborne 50-ton divisional.	5-6t treadway trucks per 60 ft. of bridge.	4	6	6	1		br plat plus 1 combat co.	1 Sqd.	45	35	30	10	50	40	35	15	55	50	45	25		

400 vehicles per hour 90-ft distance between vehicles.

• Transportation for bridge equipment only. Additional needed for any construction equipment required, and for troops.

• Includes unloading and construction only in daylight. Does not include access roads, assembly sites, abutments or anchorages.

• Average for trained troops and continuous daylight construction. Allowances are required for specific situations.

• Based on abutments at levels within 12 inches of floating bridge deck level.

• Vehicle anywhere on width of bridge deck. Speeds—15 miles per hour recommended, up to 30 miles per hour permitted.

• Center of vehicle within 12 inches of bridge centerline. Maximum speed 8 miles per hour. Vehicle spacing 150 feet. No sudden stopping or acceleration.

• Center of vehicle within 9 inches of centerline and with guide. Maximum speed 3 miles per hour. One vehicle on bridge. No stopping, braking, or gear shifting.

• Traffic capacities are for all traffic moving forward or rearward.

• Normal construction

• Reinforced construction

• Use 2-pace distance for 3 fps only; 1-bay distance for 4 and 5 fps; 2-bay distance for 6 and 7 fps.

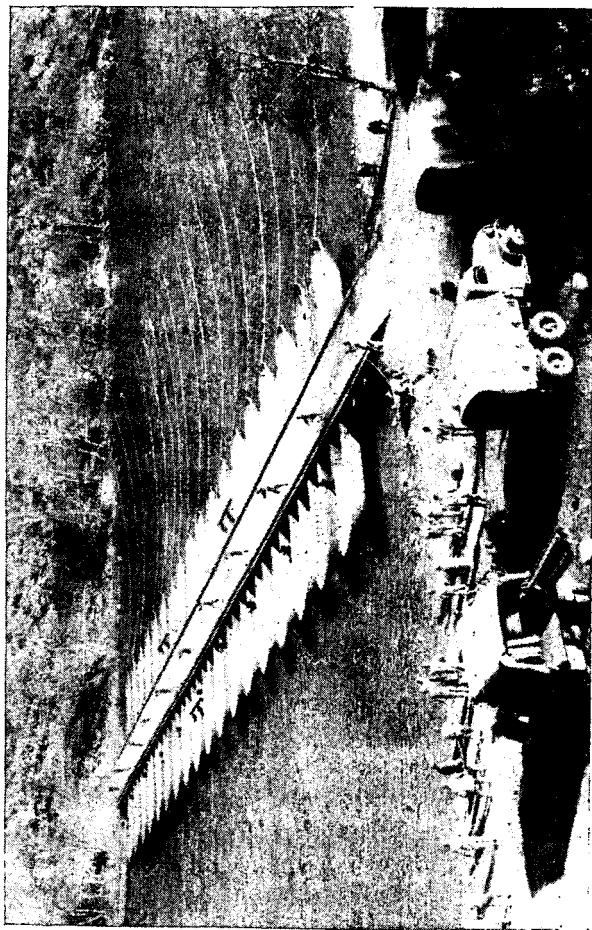


Figure 55. Floating bridge M4.

248. FLOATING BRIDGE M4

The floating bridge M4 (army depot stock) consists of a continuous roadway of aluminum-alloy deck balk supported by aluminum pontoons (fig. 55). Shore connections are made by resting the end balk upon abutment sills on the banks or by using one or more trestle spans. Balk are pinned to removable ponton gunwales, permitting pontoons to be replaced without disturbing the bridge deck. Posted capacities of the M4 floating bridge are given in table V. One set of equipment provides 428 feet of floating bridge and 195 feet of fixed bridge, or 608 feet of combined floating and fixed bridge.

249. BRIDGE, AIRBORNE, FIXED, OR FLOATING, 50-TON

This floating bridge (airborne division equipment) (TB ENG 78) combines the superstructure of the M4 bridge with the pneumatic floats of the M2 bridge (fig. 56). One set of equipment provides 695 feet of floating bridge and 105 feet of fixed bridge or 785 feet of combined floating and fixed bridge. Posted capacities of this bridge are given in table V.

250. DIVISION BRIDGE EQUIPMENT

a. Organic division bridge equipment is found in the bridge platoon of headquarters and service company of the division engineer battalion. The bridge platoon has enough steel treadway, widened, bridging



Figure 56. Bridge, airborne, fixed, or floating 50-ton.

equipment to construct: twelve 24-foot fixed bridges or one 144-foot fixed bridge, using the four trestles (fig. 57) ; or 288 feet of floating bridge. All of these bridges carry the heaviest division load.



Figure 57. Short fixed span, using 50-ton trestles.

b. Expedient river-crossing means are described in TM 5-271.

c. Characteristics of floating and ferrying equipment are given in table VI and VII.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Type of raft	Num-ber of pon-tions or float	Length		Con-struction time ^b	Con-struction party	Oper-ating crew	Capacity in tons and number of power units needed ^a								Type of power unit required	Num-ber of units	Unit
		Over-all including ramps	Avail-able for load-ing ^a				Normal crossing				Risk crossing						
							Stream velocity (fps)				Stream velocity (fps)						
1							3	5	7	9	3	5	7	9		1	Transportation required (for raft equipment only; Additional need- ed for construc- tion equipment re- and troops)
2	3	38' 0"	24' 0"	10 min			1	2	3	-----	1	2	3	(4)		2 1/2 truck w/pole thr	
3	5	50' 0"	35' 9"	15 min	1 plat	1 sqd	1	2	3	-----	1	2	3	(4)	Out- board motors	2	2 1/2 truck w/pole thr
4	7	62' 0"	47' 9"	20 min			13	10	5	-----	15	13	8	3			
5	4	64' 11 1/4"	42' 0"	30 min			13	13	8	4	10	15	10	5			
6	5	76' 11 1/4"	48' 3"	45 min			21	21	13	-----	23	23	16	8			
7	4				1 plat	1 sqd	1	1	1	2	1	1	1	2	27' bridge erection boats ^a	3	6t tread- way truck
8	6						36	36	36	20	44	44	40	25			
9	7						45	45	45	25	50	50	50	30		5	2 1/2 trucks modified
10	4						55	55	55	55	60	60	60	60		6	
11	6	87' 0 3/4"	51' 8"	1 hr	1 plat	1 sqd	1	1	1	2	1	1	1	2	27' bridge erection boats ^a	7	
	7						75	75	75	70	80	80	80	80			
							1	1	1	2	1	1	1	2			
							90	90	90	85	95	95	95	95		4	6t tread- way trucks
	4	87' 0 3/4"	51' 8"	1 hr	1 plat	1 sqd	1	1	1	2	1	1	1	2	27' bridge erection boats ^a	6	
	6	88' 8 3/4"	53' 4"	1 1/2 hr			5	35	30	20	44	44	40	25			
							1	1	2	-----	1	1	1	2			
							55	50	45	-----	65	60	50	15			

Key



Number of power units needed.
Capacity in tons (one or more vehicles).

Key



Number of power units needed.
Single vehicle capacity.
Double vehicle capacity. (Vehicles should be approximately equal in weight.)

1		2	3	4
		Stream width (feet)		
1	Operating characteristics of rafts	300	500	1,000
2	Number of round trips per hour in currents of 5 fps in daylight (reduce 50 percent for night or adverse conditions)			
3	Number of rafts which can be used efficiently at one site	10	6	4
		1	2	3

a Measured from outside edge to outside edge of end pontoons or floats.

b Construction time includes unloading and construction only, does not include preparation of landing sites or construction of access roads.

c Capacities are based on loading rafts with center of gravity of loads 6 inches downstream from $\frac{1}{2}$ of raft and on properly inflated floats.

d One 19-foot bridge erection boat per raft, in current of 9 fps.

e One 19-foot bridge erection boat may be used in currents not over 5 fps. In currents of 5 fps and over, normally two 19-foot bridge erection boats may be substituted for one 27-foot boat.

f Extreme caution is required in loading and unloading vehicles weighing more than 70 tons.

Note.—The 19- and 27-foot bridge erection boats replace the 18- and 25-foot utility boats.

Table VII. Assault and Storm Boats

1	2	3	4	5		
				Time in min for round trip across stream with width of:		
		Maximum loads	Maximum stream velocity	300 feet	500 feet	1,000 feet
River crossing means	Construction party (Engineers)					
SMALL BOATS: Assault boat M2: Single boat. 9 paddles.	Engineer crew—3 men.	12 riflemen with Ind Equip or any of the following (in addition to crew): 1 rifle Sqd. 1 Hv MG Sqd w/gun and 13 boxes Am. 1 81-mm mortar Sqd w/mortar and 50 rounds Am. 2 LMG Sqds w/guns and 20 boxes Am. 2 60-mm mortar Sqds w/mortars and 72 rounds Am.	4 fps	4	6	10

2-boat ponton with 22-hp outboard motor.	Engineer crew—2 men.	1 75-mm rifle squad w/rifle and 70 rounds Am. 1 57-mm rifle squad w/rifle and 100 rounds Am.				
		22 passengers (in addition to crew). 15 passengers (in addition to crew).	7 fps 9 fps	4	6	
Storm boat.	Engineer crew—2 men.	7 passengers or any of the fol- lowing (in addition to crew): 7 riflemen. 1 Hv MG Sqd w/gun and 9 boxes Am. 1 81-mm mortar Sqd w/mortar and 24 rounds Am. 1 LMG Sqd, 2 extra men, gun and 10 boxes Am. 1 60-mm mortar Sqd, 2 extra men, gun and 36 rounds Am.	11 fps	3	4	

Section XIV. TACTICAL PROCEDURE

251. PREPARATORY MOVEMENTS

a. Assembly Areas. In preparation for the crossing, the infantry troops which will make the crossing are secretly placed in concealed assembly areas. If possible, these areas are beyond light-artillery range, but are within an easy night's march of the crossing sites on the river. Only covering forces and the necessary reconnaissance parties are permitted to approach the river. Infantry troops complete final plans and issue final orders in these areas.

b. Attack Positions. Engineers assist infantry leaders in reconnoitering the attack positions. If possible, members of each boat crew and guides reconnoiter the route over which their boat will be carried and the point on the river from which it will be launched. An ideal attack position is—

- (1) Accessible to trucks and carrying parties.
- (2) Concealed from hostile ground and aerial observation.
- (3) Connected to the river's edge by numerous foot routes.
- (4) Close to the river to reduce hand-carrying by infantry to a minimum.
- (5) In defilade from fire of hostile flat-trajectory weapons.
- (6) Easily identifiable at night.

c. Ponton Equipment. Because it is vulnerable, difficult to conceal, and indicates intent, ponton-bridge equipment is normally held well back in rear areas, and is brought forward to the bridge site when needed, without intermediate bivouac.

d. Covering Forces. Constant vigil is maintained by covering forces to prevent enemy patrols from gaining information about the crossing, or disrupting crossing plans. They are normally provided from the general reserve and troops other than those who are to make the initial crossing.

252. ORGANIZATION FOR CROSSING

a. Preliminary. Under cover of darkness all troops go into selected positions—infantry to assembly areas, engineers to the attack position, and supporting troops into their gun positions. Assault boats are brought to the attack position by trucks when terrain, road net, and secrecy requirements permit. Engineer troops unload the boats, carry them to boat-group areas, and distribute them at the head of foot-routes to the river so they may be picked up by infantry carrying parties (fig. 58). If possible, boats are placed no more than 100 to 200 yards from the river. Engineers are assigned to specific boat groups before groups arrive at the attack position.

b. Boat Groups. Assault boats are assigned so that the infantry cross in tactical units. A boat group usually consists of three to five boats with their passengers and, if possible, contains a tactical unit. For example, an infantry platoon requiring four assault boats normally forms one boat group. Operating in boat groups assists in control of both the men and boats.

c. Organization of Engineers. Engineer assignments conform to the tactical grouping of infantry units. The tactical formation is determined by in-



Figure 58. Infantrymen carrying assault boats in preparation for crossing the Meuse River in Holland.

fantry commanders and depends on the terrain and anticipated enemy resistance. The division engineer troops normally conduct the crossing from the assembly area to the far bank and support the infantry units in obtaining their far-shore objectives. For example, in an attack where an infantry regiment is crossing two battalions abreast with the third battalion in reserve: each leading battalion crosses two rifle companies in the assault, then the heavy weapons company and battalion headquarters as soon as they are required on the enemy side, and the reserve rifle company last. Each leading rifle company crosses three rifle platoons in the first wave, followed closely by the remainder of the company in a second wave. A suggested engineer assignment based on engineer companies at approximately full strength is as follows:

- (1) An engineer squad reinforced to 15 men operates a boat group of 5 boats carrying an infantry rifle platoon. Each boat is assigned a crew of 3 engineers.
- (2) A squad of only nine men is required to operate a three-boat group carrying the company headquarters and remainder of the weapons platoon.
- (3) To insure prompt ferrying of the second wave in each leading rifle company, boats and crews are provided for the entire company. An engineer platoon, reinforced with 18 men from another platoon, is assigned to cross an infantry rifle company. The reinforced platoon is organized into four squads, each of which operates a boat

group under control of the squad leader. Groups are controlled by the engineer platoon commander.

- (4) Except when losses in the first two waves are expected to be large or the width of the river makes round-trip time prohibitive, the rest of the battalion is crossed in boats which return to the near shore after crossing the leading rifle companies. An engineer company is assigned to cross an infantry rifle battalion.

d. Infantry Preparations. Infantry makes final plans for the attack and organizes boat teams before leaving the assembly areas. Supporting fire for the crossing is furnished by heavy weapons companies of all battalions if practicable, by the covering force normally provided from the general reserve, and by artillery units. Weapons positions selected by prior reconnaissance and coordinated with the covering force are occupied in time to cover the crossing of the first wave.

253. CROSSING INITIAL WAVES

a. Procedure. Heavy weapons companies move into support position and leading infantry units move to the attack position simultaneously so the attack can be made at the designated time. At the attack position, the first assault waves on all fronts are met by engineers who lead them first to their boats in the boat group areas and then to the riverbank. Each infantry boat team carries its own boat. Once units leave the attack position, however, they do not halt for coordination and no attempt is made to

maintain alinement between boat groups. Upon arrival at embarkation points, troops embark immediately and paddle to the far shore. In night crossings, firing from boats is prohibited. Special equipment, such as woven wire matting and bangalore torpedoes, may be carried in assault boats to facilitate passage of obstacles not cleared by fire. After neutralizing enemy resistance near the bank, leading infantry units advance to the first objective. Second wave troops of each company delay the departure from the attack position long enough to allow the first wave to clear the shore.

b. Handling Assault Boats.

- (1) Ten to twelve infantrymen carry an assault boat. The engineer crew of three act as guides and carry the paddles. Since weapons platoon squads and platoon headquarters are small and the men are heavily loaded, company basics or battalion headquarters company personnel help them in the carry. These extra men do not cross the stream until later in the operation.
- (2) From the time troops leave the attack position until they reach the far bank, no unnecessary stops are made. The boat is carried upside-down to a spot previously selected by the engineer platoon commander within a few yards of the water's edge. Here the boat is righted, great care being taken to preserve silence. Objects must not be allowed to strike the sides or bottom of the boat. Rifles are slung diagonally, muzzle up, from the shoulder nearer

the boat. Special care must be exercised in carrying the boat after it is righted to prevent the bottom from striking stumps, rocks, and other obstructions.

- (3) On arrival at the riverbank, the boat is immediately carried bow-first into water deep enough to float the fully loaded boat. No change is made in the carrying formation. The boat is loaded parallel to the bank if the water is deep immediately offshore. Ammunition, machine guns, and similar weapons and equipment are quietly placed in the boat, and all rifles unslung. Passengers then climb aboard, taking care to keep the boat in balance and to avoid noise. The engineer crew steadies the boat. Infantrymen assigned to paddle hand their rifles to passengers in the center of the boat. Engineers pass paddles to the infantrymen along the sides of the boat. Each engineer crew member retains one paddle for his own use. When all infantrymen are in the boat, two engineers take positions in the bow, one on each side. The third engineer soldier pushes off, kneels in the stern, and steers the boat across the stream. The senior infantryman aboard is responsible for directing the craft to its landing area. The infantrymen at the sides paddle the boat, engineer paddlers at the bow setting the stroke. Paddlers kneel on their outside knees, being careful not to scrape the sides of the boat with their paddles. Those not paddling

crouch low in the boat, holding rifles upright on the bottom. Before leaving the shore, all men loosen their rifle belts and helmet straps so packs and helmets can be discarded easily if the boat capsizes or sinks.

- (4) As soon as it is loaded, each boat is paddled as rapidly as possible to the opposite bank. Normally, the boat is headed straight for the far shore; no effort is made to counteract drift. Specific orders may be issued to paddle against the current to avoid being swept downstream if the relative locations of embarkation and debarkation points are unfavorable, or if the stream is wide and the current swift.
- (5) Upon arrival at the far shore, silence is observed unless the enemy has discovered the crossing and opened fire. To avoid noise, boats are beached on mud bottoms when possible. The two engineer soldiers in the bow disembark first and hold the boat steady while the paddlers get out and place their paddles quietly in the boat. All passengers then step into the shallow water or directly ashore. Cargo is unloaded. The entire crossing is made with utmost speed and silence. As soon as the enemy discovers the crossing, quiet is sacrificed for speed. Boats are loaded and unloaded as rapidly as possible to minimize the length of time men are exposed to enemy fire.

254. CROSSING SUCCESSIVE WAVES

a. Each boat returns independently to the near shore as soon as unloaded. When necessary, each engineer squad leader reassigns men from disabled boats to crews which have lost men. When boats reach the near shore, they are normally paddled upstream to their loading points. Each squad leader reports to the engineer platoon commander as each boat group returns. The infantry commander is notified and decides whether to send over the next load of infantry as each boat group returns or to wait until all boat groups have returned.

b. It may be necessary for boat crews to return to the near shore at points other than the initial embarkation sites. Decision as to where the boats are to return is made before the crossing and instructions are issued to crews before the first wave leaves.

c. In performing its mission of supporting the first wave, the heavy weapons company, normally assigned to the third wave, is dispersed over the battalion front. Its initial reconnaissance of the river line includes routes to embarkation points of the supported units. On order of the infantry battalion commander, elements of the company move forward over these routes to embarkation points and cross in boats previously used by the first two waves. When necessary to make up losses, boats are shifted from other boat groups to the heavy weapons company.

d. When crossed in boats, the fourth wave, usually the reserve rifle company, is assigned to boat groups, guided to the embarkation point, and crossed much the same as the first wave. Infantry assigned to this and succeeding waves may be required to carry addi-

tional assault boats forward to the embarkation point to serve as replacements.

255. CROSSING BY STORM BOATS

Over wide rivers or when secrecy can be disregarded, storm boats may be used. It must be decided early how many troops will be crossed and what will be the tactical formation, since these factors will determine the number of boats required. Storm boats and outboard motors may be obtained from class IV depot stocks, and operators from available engineer sources. The tactical procedures and handling of boats are similar to those for the assault boat M2 except for the following changes:

a. Loads. Storm boats carry smaller loads and enough must be provided to allow for this fact (par. 243).

b. Launching Boats. Whenever possible, engineers conceal the boats at the water's edge before the infantry arrives. If this is not possible, the boats are concealed, with motors attached and resting in the boats' bottoms, as close to the bank as possible. They are carried to the river by infantry and launched stern first. The water should be deep enough to prevent the propeller from touching bottom under a full load.

c. Embarkation. After weapons and equipment have been placed aboard, the passengers get aboard and lie in the bottom. One engineer helps shove the boat off and lies at the bow; the other engineer maneuvers the boat and operates the motor.

d. Unloading. Boats may beach under power at the far bank, turn in shallow water to avoid stopping

their motors, or use a combination of these methods to discharge their loads. Crews of boats beached under power help one another in returning boats to the water.

e. Control Measures. To insure that successive waves are loaded and unloaded without confusion, large numbered or lettered signs are posted at each loading point, and signs to mark unloading points are carried to the far bank in the first crossing. At night, phosphorescent paint may be used. Such measures will appreciably speed up the operation.

f. Successive Waves. Successive loads are guided to loading points where they await return of the boats. No effort is made to coordinate movements of teams with individual boats, since this would deprive the operation of its advantage of speed.

g. Reserve Boats. A reserve of boats, motors, and crews is assigned to each crossing zone and is placed close to the river before the initial wave departs.

h. Special Precautions. Because of the storm boat's high speed, its operation is not practicable under conditions of poor visibility, or in the presence of underwater obstacles or large quantities of debris. Boats must not be loaded in excess of the typical loads shown in paragraph 243. Motor operators must be quickly trained in handling and servicing these large motors. Engineer crews and infantry passengers should rehearse the crossing before the combat operation.

256. ILLUSTRATIVE SITUATION

The following situation for crossing an infantry regiment illustrates the use of storm boats.

a. The stream to be crossed is 1,200 feet wide and has gently sloping, sandy beaches on both sides. The infantry commander has decided to cross two battalions abreast in the assault with one battalion in reserve. The battalion crosses companies in column, each company comprising a wave. The second rifle company, the heavy weapons company, the battalion headquarters and headquarters company, and the third rifle company of each battalion cross in that order in the boats which ferry the assault companies.

b. Covering forces, normally from the general reserve, hold the near bank while preparations for the crossing are completed. Preliminary reconnaissance of the near shore is made by infantry and engineer parties. Attack positions are chosen for each leading battalion. Mines are cleared from attack positions and routes over which boats will be carried. Engineers prepare lettered or numbered signs to mark loading and unloading points.

c. Seven boats are provided for each rifle platoon and 9 for the weapons platoon and company headquarters, making 30 boats per assault company. Two assault companies per regiment require 60 boats, plus one-third reserve boats (20), making 80 boats required for the crossing. These boats may be obtained from class IV depot stocks. Boat groups are organized as described in 252*b* above, preserving the integrity of infantry units as far as possible. For a breakdown of storm boat requirements, see table VIII.

d. One engineer guide is assigned to each pair of boats and one to the company headquarters boat. Two engineers form the boat crew, one as bowman,

Table VIII. Typical Storm Boat Requirements For Crossing An Infantry Battalion (40 Boats)

	Number of men crossing	Number of storm boats	First wave	Second wave	Succeed- ing waves
Infantry Rifle Company:					
Rifle platoon	46	7	7	7	7
Rifle platoon	46	7	7	7	7
Rifle platoon	46	7	7	7	7
Co headquarters	13	2	2	2	2
Weapons platoon	49	7	7	7	7
Total	200	30	2 30	2 30	3 30
Plus $\frac{1}{3}$ reserve boats	(1)	40			
Infantry Heavy Weapons Company:					
MG platoon	42	7			7
81-mm mortar platoon	49	8			8
75-mm rifle platoon	28	5			5
Co headquarters	21	3			3
Total	140	23			23

Infantry Bn Hq & Hq Company:

Battalion headquarters det.....	16	3	-----	-----	3
Headquarters company det.....	11	2	-----	-----	2
Bn Hq section.....	8	}	-----	-----	7
Intelligence section.....	8		-----	-----	
Communication section.....	31		-----	-----	
Bn medical det.....	20	3	-----	-----	3
Pioneer & ammo platoon.....	26	4	-----	-----	4
Total.....	120	19	-----	-----	19

¹ Reserve of 10 boats manned and held out for replacement of boat losses to assure sufficient boats to cross remainder of battalion.

² Necessary forward artillery and mortar observers and radio operators cross in certain boats of the initial waves as directed. Medical aid men cross with all units.

³ 1 engineer platoon crosses itself in 5 boats for far-shore work.

and the other as motor operator. Operators are organized into provisional boat platoons before the crossing and should rehearse the operation with the bowmen, guides, and infantry who will make the assault. A provisional boat platoon to cross one battalion may consist of 40 boats with operators, 40 bowmen, 15 guides, and a platoon commander. The bowmen and guides should know also how to operate the motors and boats.

e. In this case, crossing is made just before dawn when the far shore becomes visible. On the night preceding the crossing, provisional engineer boat platoons bring boats to the attack position. The 30 boats required for the initial crossing of 1 infantry battalion are carried to the water, and launched or left at the water's edge. Motors are attached, fuel is checked, and operator's tools and spare parts are laid in the bottom of the boat. Signs marking the loading points are posted so they are visible from the shore and from the river. Signs to mark unloading points are laid on the boats. Normally, only one unloading point is marked for each boat group. Every effort is made to maintain silence. Ten reserve boats for each battalion are placed with crews in the attack position from which they may be rushed to replace losses.

f. Infantry units are divided into boat-group teams in the assembly areas. Heavy weapons companies of each battalion leave the assembly areas first and take up positions to add their support to the crossing. Leading rifle companies leave the assembly in time to reach the attack position just before the hour of attack. Engineer guides meet the two loads assigned

to each pair of boats and lead them to the river. The infantrymen carry the boats to the river if they are not already afloat. The engineer bowmen steady the boats while the infantrymen board and lie down on the bottom. The bowmen then climb aboard and motors are started, often at a prearranged signal which must be known and be visible or audible to all operators.

g. If the far shore is known to be clear of underwater obstacles such as logs, stumps, or enemy-laid antiboat devices, a smoke screen may be laid on the hostile shore immediately before the attack to cover the initial crossing. If not, the screen is omitted so the operators can avoid such obstructions.

h. If, as in this case, the enemy shore permits beaching of boats, infantry commanders determine the need for such action by a study of anticipated resistance. Consideration must be given to the fact that time is lost when boats are being relaunched and high engineer casualties may result. Since four men are needed to drag a boat, boat crews help each other in relaunching their boats. Before leaving the far shore, they post the signs marking each boat-group landing area. Speed is essential, particularly if the beach is under fire.

i. Boats return directly to their embarkation points. The second rifle company may cross immediately by individual boatloads or may cross as a second wave, depending on the plan of the infantry battalion commander. If boat losses are heavy, reserve boats are carried to the water and launched. If the second rifle company is not to cross by individual boatloads, boat-group leaders assemble their

guides and report to the attack position, where they report their losses in men and boats to the engineer platoon commanders. Engineer platoon commanders then contact infantry commanders and plans are made for crossing the second wave.

j. Training before the operation and speed and timing during its execution are essential. Outboard motors are subject to sudden mechanical failures. Operators must be prepared to take immediate action if the motor fails.

257. CROSSING ON FOOTBRIDGES

a. Footbridges may be used to cross first waves over narrow streams. However, due to the difficulty of construction under small-arms fire, they are usually not installed until the first objective has been taken. They are then used to cross supporting foot troops.

b. Footbridge equipment is concealed close to the river before the initial assault. Carrying parties are organized to deliver the equipment to the riverbank as construction proceeds. To facilitate delivery, equipment is brought by truck as close to the river as the road net and tactical situation permits.

258. CROSSING ON RAFTS

a. When the first objective has been taken and supporting infantry units have been brought into position, attack on the second objective is pressed without delay. Since achievement of this objective will deprive the defender of his ground observation of the river, strong resistance is to be expected. Counterattacks, possibly armored, are certain. Ar-

tillery support against counterattacks is furnished both by units which are in their initial positions and by those which have moved across the river. Protection against mechanized counterattacks is furnished by antitank weapons and by mines laid as advanced positions are consolidated.

b. Before it is practicable to use floating bridges, infantry support rafts are used to cross light vehicles needed to support the assault waves. Rafts can be built and operated as soon as small-arms fire is eliminated from the crossing sites. They can be transported to sites which cannot be reached by the heavier transportation required for other floating equipment. The rafts are used for crossing trucks that carry infantry supporting weapons, ammunition, and other supplies; for some light artillery and antiaircraft units, and for medical, engineer, and signal vehicles.

c. The importance of infantry support rafts in a river-crossing operation cannot be overemphasized. Foot troops crossed by assault boats or other means and unsupported by artillery are at a great disadvantage when subjected to vigorous counterattack. Construction and use of vehicular bridges under small-arms and/or observed artillery fire is difficult, if not impossible. Rafts heavier than the infantry support raft may be constructed at the same time for ferrying armored vehicles.

d. Ferrying of combat vehicles is continuous until bridges are built. Even then, use of rafts may be continued to evacuate ambulances and other returning vehicles.

259. CROSSING ON BRIDGES

a. When the second objective has been taken, or earlier if enemy artillery fire is ineffective, the crossing commander directs that the bridge be constructed. Under normal conditions, floating bridges are used. If the stream is narrow and banks are suitable, standard fixed bridges may be used. In either case, the tactical factors influencing the commander's decision are the same; small-arms and effective artillery fire must be eliminated before construction can begin, and the assault troops on the far bank must be reinforced with all available armor as soon as possible.

b. The greater the number of bridges, the quicker and surer the crossing. Principal and alternate sites for each bridge are selected well in advance. Bridging equipage is not brought to the bridge site until the initial phase of the action indicates that the site can be used.

c. When the bridge has been completed, the remainder of the artillery, armored units, engineer equipment, and other supporting troops are crossed, making possible additional coordinated operations on the far shore.

Section XV. ENGINEER PLAN

260. GENERAL

a. Since the capabilities of the divisional engineer battalion are insufficient to support the division in a deliberate river crossing, corps usually provides an engineer combat group to support the division during the crossing. Although far-bank tasks relative to the continuation of the attack may prohibit use of

all or part of the division engineer battalion for crossing tasks, it is highly desirable that the battalion be used on tasks requiring close coordination with the infantry, such as the assault-boat crossing. This is particularly true where time does not permit proper coordinated training prior to the crossing. Missions are assigned well in advance to allow enough time for detailed reconnaissance by the engineer combat group commander and his staff, and to permit any necessary changes in the composition of the group before the actual operation. When two divisions are crossing simultaneously, early planning allows the corps commander time to make adjustments in the corps plan. Usually, the corps plan designates the number and location of heavy floating and fixed bridges.

b. Using the corps plans as a basis, the division engineer, aided by the engineer combat group commander, develops the engineer plan for engineer operations necessary to cross the division. The engineer plan estimates the engineer troops and equipment required for each phase of the operation, and assigns missions to elements of the division engineer battalion and supporting engineer group. The group's work on the far shore is usually limited to raft and bridge exits.

c. In addition to a thorough knowledge of the technical aspects of the crossing, the engineer battalion and group commanders must know the tactical plans of the corps and division commanders. When technical engineering considerations are the deciding factor in determining tactical plans, the infantry commander is informed as to what tactical plans can be

supported with engineer means available under existing conditions.

d. Certain general principles must be followed in preparing any river-crossing engineer plan. In general, they are as follows:

- (1) Division engineer support to leading elements of the division is only large enough to provide those units with the means necessary to their forward advance. In designating units, the normal association of units within the division is preserved.
- (2) An engineer reserve of men and equipment is provided to replace losses and to exploit successes. This reserve is usually one-third of the minimum requirements of the proposed plan. Whenever possible, the personnel reserve is rotated by having units completing their tasks return to the reserve, to be used as fresh units on later tasks.
- (3) Unity of command is preserved as far as practicable. For example, a task assignment consists of a nondivisional battalion less a company, not two companies, or of a company with a platoon attached, not a company and a platoon.
- (4) Plans provide engineers to carry on essential engineer work in rear areas during the crossing.
- (5) Antitank and antipersonnel mines are removed from the approaches to the river, attack positions, and equipment parks before the operation starts. These sites are selected with the concurrence of the infantry

elements concerned as far in advance as possible, to allow time for division engineers and supporting engineers to clear and mark them. Infantry covering units prevent infiltrating enemy troops from re-laying the mines.

- (6) Local protection of engineer working parties during the operation is provided by division or corps. Bridge sites must be cleared of small-arms, mortar, and observed artillery fire before efficient construction can begin.
- (7) Antiaircraft protection is provided for bridges during both construction and operation. This is a function of higher headquarters, but the engineer commander on the site must assure himself that its protection is adequate and so located that it does not interfere with construction and use of the bridge.
- (8) Bridge protection devices are installed to prevent damage to bridge from waterborne surface craft, mines, and swimmers. These devices usually consist of a series of booms, each boom designed to stop one or more types of attack.
- (9) When the situation warrants, deceptive measures may be used. These may range from creating false activity at potential bridge sites not to be used, to the erection of a dummy bridge, utilizing an engineer camouflage unit.

- (10) The need for engineer equipment on far-shore tasks must be anticipated. Plans for moving such equipment to the far shore are included in the division traffic-priority plan.

e. In the development of an engineer plan for a specific river-crossing operation, stream width and amount of equipment often govern the tactical formation. The amounts of engineer equipment required vary directly with the stream width. In addition, variations in type of equipment and manner of use also result. For crossings of streams with widths up to 600 feet, paddled assault boats are normally used in the assault phase; whereas, for stream widths greater than 600 feet, powered assault boats, storm boats, and in some cases small Navy craft are used. Tank rafts used in crossings over 300 feet are not normally needed for narrower crossings. Similarly, engineer troop requirements for both individual tasks and the over-all task vary greatly as the stream width increases.

261. ILLUSTRATIVE SITUATION

The development of an engineer plan in a relatively simple situation is outlined below. In the field, the tactical situation and the availability of engineer troops and equipment greatly influence the final plan. However, the general principles, if soundly applied, will result in a workable plan in any situation. The division is part of a corps which is crossing with two divisions abreast. One floating bridge will be provided in each division area. The engineer plan for the one division develops as follows:

a. Technical Considerations. The stream is 250 feet wide, has an average current of 3 feet per second, and is too deep to be forded. Bank conditions are favorable to the use of assault boats at almost any point. Two roads suitable for main supply routes approach and leave the stream. The road net is such that at least at four other points vehicles can also reach the stream and leave it on the far side. Approaches to the selected bridge site can be prepared by an engineer platoon with a dozer in about 3 hours.

b. Tactical Considerations. The plan is to make the initial crossing with two infantry regiments abreast with battalions in column. Each of the leading (assault) battalions is to cross with two rifle companies abreast. A section of 75-mm rifles and a section of machine guns is attached to each assault rifle company. The remainder of the battalion is to cross in returning assault boats. Three rifle platoons with a 57-mm rifle squad attached to each are to cross abreast in the first wave. This is to be followed by a second assault-boat wave composed of the weapons platoon less detachments, a detachment of company headquarters, attached direct fire weapons from the heavy weapons company, and the artillery forward observer party. Then comes a third wave composed of the heavy weapons company less detachments, a detachment of battalion headquarters, forward elements of the medical platoon, and liaison personnel. The reserve rifle company, battalion headquarters company, and medical platoon less detachments are to cross in returning assault boats of earlier assault waves. Essential vehicles are to cross

on infantry support rafts. The foot elements of the remainder of the assault regiments are to cross by footbridge. Tank units of the assault regiments, the third infantry regiment, division artillery, and the remainder of the division are to cross on the floating bridge. Both shores are known to be heavily mined and the roads have been damaged by artillery fire.

c. Assignment of Engineers to Accompany Infantry for Far-Bank Operations. The division engineer decides to provide each assault battalion with one engineer platoon for far-bank support. Each engineer platoon will cross itself and its equipment in four assault boats.

d. Assignment of Assault Boats with Crews. The assignment of assault boats and crews to cross the assault battalions is one of the major problems confronting the division engineer. Enough boats are provided to cross the assault waves of each assault battalion. Not counting filler personnel, 53 boats are required for each battalion. The boats are utilized as follows:

In the first wave: 30 boats (5 boats each to the 3-rifle platoons with a 57-mm rifle squad from the weapons platoon attached to each, for each of 2 rifle companies).

In the second wave: 12 boats (2 boats to the remainder of the weapons platoon, 1 boat to company headquarters and artillery observer party, 3 boats for each rifle company for attached direct fire weapons from the heavy weapons company).

In the third wave: 11 boats (9 boats to the heavy weapons company, less detachments, 2

boats for the command detachment of battalion headquarters).

In succeeding waves: (Returning boats from 3 assault waves) 18 boats to reserve rifle companies; 8 boats to battalion headquarters and headquarters company; 2 boats to medical platoon less detachments.

Crews for the first, second, and third waves are 53×3 or 159 engineers. Guides (1 guide per 2 boats) should be provided to aid the final waves; 14 men are required. Assuming 36 men per engineer platoon, a total of 5 platoons of engineers, are required for crews and guides. One engineer company plus 1 platoon less 1 squad can furnish crews for the first wave and second wave. One engineer company less 1 platoon, plus 1 squad, can furnish third-wave crews and guides, and a platoon for far-bank work.

e. Footbridge. A footbridge will be constructed for each of the two assault regiments. Each will be constructed by an engineer platoon at a time concurred in by the respective regimental commanders.

f. Infantry Support Rafts. To ferry the essential combat vehicles, the plan provides for the construction of two 5-ponton (10-boat) infantry support rafts in each leading regimental area, the two rafts to be operated from one site. One platoon can prepare approaches, and construct and operate the rafts at each site.

g. Tank Rafts. Although not a part of this illustrative situation, rafts constructed from floating-bridge equipment are normally used for ferrying tanks if the stream width is greater than 300 feet.

For crossings of streams 300 feet or less in width, bridges are generally in operation soon enough to eliminate the necessity for tank rafts. Depleted bridge stocks may limit a division to a single floating bridge even on a narrow stream. In such cases, use of some of the division's organic bridge equipment for a tank raft in each regimental section would be justified.

h. Floating Bridges. A treadway bridge, widened, will be constructed at the site selected; time of construction will be designated by corps order. One unit of treadway bridge (288') carried by a platoon of the treadway bridge company will be attached to a combat engineer company and assigned to the bridge site. For streams wider than 300 feet, a minimum of two engineer combat companies and additional bridging equipment would normally be required for construction at each site.

i. Near-bank Engineer Work is performed before and during the crossing. Troops are provided for road maintenance, water supply, and other general engineer work. During the planning phase, the supporting corps engineers and the division engineer battalion are used to complete as much of this work as possible, with the corps engineers taking over to free the division engineers for the assault-boat phase. Assume two engineer combat companies are required.

j. Bridge Protecting Devices. Two booms will initially be installed upstream of the treadway bridge, capable of protecting it from destruction by floating mines, debris, or swimmers. Any additional protective devices deemed necessary will be constructed after the initial booms. One engineer pla-

toon will be assigned to construct the booms and any additional protective devices.

k. Total Requirements.

(1) *Working forces and equipment required.*

See table IX for a summary of the engineer plan for utilization of troops and equipment in the various phases of the operation. The division engineer battalion, two battalions of the supporting engineer combat group, and a treadway bridge company are used in the crossing operation.

Note. Requirements for crossing streams 500 feet wide are shown for comparison only.

The engineer units normally participating in an operation of this type are a corps engineer combat group and the organic division engineer battalion. The division engineer battalion will supply the personnel for the assault-boat crossing and far-bank work. The supporting corps engineer group provides personnel for the remaining engineer tasks.

- (2) *Reserve troops.* The engineer group commander will use two of his combat battalions initially. The third battalion will be in working reserve in the rear area, with certain personnel placed on call in case additional troops are needed. In the assault phase of the crossing, the entire division engineer battalion will be committed. Two engineer platoons are in support of the forward infantry units. The remainder of the engineer battalion is assembled on the near

Table IX. Engineer Troop and Equipment Requirements

Task	Stream width	Equipment plus reserve	Engineer units required
Assault crossing-----	250 feet	$(53 \times 2) + (4 \times 2)^1 = 114^2$ boats	$5 \times 2 = 10$ platoons
	500 feet	Same	Same
Far-bank work-----	250 feet	As required	$1 \times 2 = 2$ platoons
	500 feet	Same	Same
Footbridges-----	250 feet	$(250 \times 2) + \frac{500}{3} = 667$ feet of bridging	$1 \times 2 = 2$ platoons
	500 feet	$(500 \times 2) + \frac{1,000}{3} = 1,334$ feet of bridging	Same
Infantry support rafts-----	250 feet	$(2 \times 2) + 2 = 6$ (5-ponton)	$1 \times 2 = 2$ platoons
	500 feet	$(3 \times 2) + 2 = 8$ (5-ponton)	Same

Tank rafts-----	250 feet	None required	None required
	500 feet	$(2 \times 1) + 1 = 3$ (6-float)	1 platoon
50-ton division bridge----	250 feet	$(250 \times 1) \div \frac{250}{3} = 334$ feet of bridging	Platoon of the treadway bridge company plus 1 engineer combat company.
	500 feet	$(500 \times 1) \div \frac{500}{3} = 667$ feet of bridging	Treadway bridge company plus 2 engineer combat companies.
Bridge protective devices---	250 feet	As required	$1 \times 1 = 1$ platoon
	500 feet	Same	Same
Near-bank work-----	250 feet	As required	$1 \times 2 = 2$ companies
	500 feet	Same	Same
General area responsibility--		As required	$1 \times 1 = 1$ battalion

¹ Assigned engineer platoon supporting assault infantry on far bank.

² No reserve required since assault waves are initially provided with sufficient boats.

bank after the assault-boat phase, prepared to move to the far bank as required.

- (3) *Reserve equipment.* The reserve of river-crossing equipment is at least one-third of the basic requirements. Reserve rafts are complete rafts only. The total crossing equipment organically available in the supporting engineer combat group is:

Assault boats:

1—Engineer treadway bridge company	=14
1—Engineer light equipage platoon	
when authorized	=70
	<hr/>
	84

Footbridge—1 unit	=432 feet
Infantry support rafts	=7 (5 ponton)
12 (3-ponton)	
Treadway floating bridge, 3 units	=864 feet

Do not consider divisional bridge as reserve in computing requirements, since it will normally be required by the divisional battalion for short-gap bridging and for continued operations on the far bank. Comparison with the requirements given in paragraph 260 shows that organic equipment is enough to meet crossing requirements and reserve except for the footbridge and a few assault boats. This shortage is remedied through procurement of additional equipment from a depot or another light equipage platoon. Division engineer battalion assault boats remain loaded, but may be used in the assault crossing if assault boat supply is critical.

l. Assignment of Engineer Troops and Equipment.
In accordance with the principles stated in 258*d* above, the following assignments of engineer troops and equipment are planned (see table IX).

Divisional battalion—assault-boat crossing, and far-bank work in the division area.

Supporting engineer combat group.

One combat battalion—footbridge, infantry support rafts, floating bridge, bridge protective devices, and near-bank work in one regimental area using 336 feet of footbridge, five 3-ponton rafts, and about 336 feet of floating bridge from the treadway bridge company.

One combat battalion—footbridge, infantry support rafts, and near-bank work in second regimental area, using 336 feet of footbridge and five 3-ponton rafts from the treadway bridge company.

One combat battalion—general area responsibility, including road maintenance to the river line.

m. Signal Communication.

(1) *General.* A complete signal communication system must be provided for a deliberate river crossing, to insure prompt and efficient movement of engineer equipment and personnel, and control of traffic. Important engineer uses of signal communication are—

(a) To order engineer equipment forward to crossing sites when needed.

- (b) To control engineer troop movements during all phases of the crossing.
- (c) To direct and control bridge construction.
- (2) *Means.* All available means of signal communication, including organic engineer radio and telephone facilities, motor messengers, runners, and visual signals, are used to provide duplicate and alternate channels. The system may be extended by division or corps signal units.

n. Traffic Control. Rigid control of traffic is essential during a river-crossing operation. The engineer recommendation for the division traffic-control plan includes a traffic circulation map that designates one- and two-way roads and the type of traffic they can carry, the capacity of bridges, and the proposed locations of control points for regulating vehicles crossing bridges. Control points are located at road junctions or other turn-outs to permit the diversion of vehicles whose weights exceed the capacity of the bridge. Engineers make and post signs which designate routes and bridge capacities, and guide traffic to important installations.

Section XVI. INFANTRY COMBAT

262. GENERAL

a. Divisional engineers must be able to fight as infantry when the need arises. They maintain their own close-in security while on the march, in bivouac, or at work. Fighting to provide this security often involves small units of squad, platoon, or company size. Ordinarily, very little time is available to plan

or reorganize for combat. In certain situations combat engineers are relieved of engineer functions and assigned specific infantry combat missions. This step is taken by a commander only after carefully weighing its value against the effect upon the performance of necessary engineer work. The unit engineer must advise his commander of the effect engineer work stoppage will have on accomplishment of the mission of the higher unit. Further, the unit engineer must advise his commander of the comparative capabilities and limitations of the engineer unit used as infantry.

b. The basic tactical training of engineers parallels that of the infantry. However, the engineers receive much less tactical training with a consequent reduction of combat capabilities. The combat capabilities of the engineer battalion are further limited by a lack of close support weapons, difference in communication facilities, and less medical and evacuation personnel as compared to an infantry battalion. For these reasons, engineers committed to combat are used primarily as defensive rather than offensive troops. To insure coordination of supporting fires, engineer units are normally attached to larger infantry units when fighting as infantry. To compensate in part for the above disadvantages, engineer units are assigned smaller frontages than infantry units of corresponding size. The employment of the combat companies as infantry depends upon the tactical situation, the mission, and the frontage responsibilities assigned the battalion.

c. Training of the division engineer units in infantry tactics should be built around the plan or SOP

for reorganization for combat. Emphasis must be placed on training company officers in the proper utilization of supporting mortar and artillery fire. See FM's 7-10 and 7-20 for employment of infantry units.

263. GENERAL ORGANIZATION FOR COMBAT

a. When in combat, either in furnishing its own security on engineer missions or in performing missions normally assigned to infantry, the engineer combat company is organized to provide command, rifle, and crew-served-weapon elements. Normal organization is modified to provide for effective use and control of crew-served weapons, for security of equipment not needed for combat, and for the special problems of command, communication, and supply incident to combat. Standing operating procedure (SOP) for infantry combat is set up for the battalion, companies, and platoons, to establish definitely the duties of personnel.

b. When the engineer battalion or any of its elements enters combat it is divided into forward and rear echelons.

- (1) *The forward echelon* consists of the elements that actually engage in combat, and also the command, communication, and supply personnel and equipment necessary to control and supply the combat elements. In most situations, the light vehicles are needed in the forward echelon for security, communication, ammunition supply, and the displacement of crew-served weapons.

- (2) *The rear echelon* is commanded by the senior officer or enlisted man included therein. It consists of the personnel and equipment not needed for combat, including kitchen trucks, trucks carrying supplies and equipment, and special vehicles such as air compressors, cranes, tractors, and other heavy equipment. The number of personnel assigned is the minimum necessary to maintain the mobility of the rear echelon, provide for its local security, and perform essential administrative functions. The actual composition and location of the rear echelon varies with the situation and the size of the unit. In small engineer units operating alone, the rear echelon is often close at hand with only the vehicle drivers for protection. When the engineer battalion participates in the defense of a position, the rear echelon is usually a considerable distance to the rear; at least beyond the range of enemy light artillery.

c. The extent of reorganization for combat varies with the size of the unit, the time available, and the mission. The battalion is generally deliberately committed to combat, allowing time for necessary adjustments *before* meeting the enemy. However, when a platoon operating alone on an engineer mission becomes involved in combat, the change is made as quickly as possible and is based upon fragmentary orders issued *after* contact. Each rifle company consists of a company headquarters and three rifle platoons. The rifle platoons are organized into a platoon headquarters, three rifle squads, and a weapons squad.

d. Engineer operations are normally suspended when the unit is committed to combat. However, certain types of engineer work, such as water supply, supply of engineer materials, and engineer reconnaissance, may be continued by personnel of the rear echelon. In certain situations, an engineer company may be held out and assigned engineer missions in support of the division defensive operation.

e. See appendix III for details of a typical reorganization of the engineer combat battalion, divisional, for combat as infantry. See FM 7-20 for relief of front line units.

264. SUPPORT, FIRE POWER, AND COMMUNICATION FACILITIES

a. In order for the engineer battalion to be an effective fighting force as infantry, it must be provided with supporting fire and additional means of communication. If the engineer battalion is committed deliberately as an infantry unit, this necessary support is gained by attaching the battalion to an infantry regiment. It then becomes the responsibility of the regimental commander, to whose regiment the battalion is attached, to furnish the necessary supporting fire. This is normally done by the regimental commander assigning one or more platoons of the heavy mortar company in direct support of the engineer battalion. The forward observers for this platoon or platoons join the engineer combat companies employed on the front line. The supporting field artillery battalion supplies forward observers and an artillery liaison officer for the battalion. By making these assignments, the respon-

sible regimental commander furnishes adequate high-angle fire support for the engineer battalion.

b. For antitank protection the engineer battalion has several 3.5-in. rocket launchers and its medium tanks. In addition, the regimental commander may attach elements of the regimental tank company to the battalion to furnish antitank protection, or the regimental tank company is held in reserve and is prepared to counterattack any penetration in the engineer sector, as well as other sectors within the regimental area.

c. In preparing for combat, the engineer battalion must also plan for a more comprehensive signal communication system than is normally necessary. The extent of the communication facilities required varies with the type of situation. In a defensive situation, for instance, it is necessary to establish communication laterally. This can be accomplished by taking two radios from the battalion net and netting them with the units on the left and right. The battalion communication section ties in with the regimental net. The efficiency of the assault platoon can be increased by netting with the regimental tank company.

d. Since only one means of communication cannot be relied upon, the radio nets must be paralleled by wire nets. The infantry regiment, to which the battalion is attached, lays a wire from the regimental communication switchboard to the battalion switchboard. This is paralleled by a wire in the field artillery net. The field artillery continues its wire net down to each employed company on the front line. The engineer battalion's communication section lays

a wire to each of the engineer companies. The battalion communication section also lays a lateral line to the adjacent battalion on the right and receives a lateral line from the adjacent battalion on the left. For additional signal communication information in the infantry division see FM's 7-10, 7-20, 7-24, and 7-25.

Section XVII. SPECIAL OPERATIONS

265. GENERAL

Engineer operations during special operations basically remain the same, but extremes in climate and terrain characteristics tend to shift the importance from one engineer job to another, depending on the varying conditions. Equally as important is the effect of climate and terrain on the physiological and psychological make-up of troops operating there. This section briefly discusses the probable main concern of the engineers in certain types of special operations, and some of the special problems which will confront them in different climates and terrain. References for more detailed discussion of these problems are given at the end of each paragraph.

266. ATTACK OF A FORTIFIED POSITION

a. Elements of the engineer combat battalion, divisional, with divisional teams of combined arms, participate in the attack of fortified positions. The principal mission of the engineers is to breach the outer and larger obstacles such as mine fields, wire obstacles, road blocks, and antitank ditches and traps, protecting the main fortified positions. The

actual reduction of the fortifications, and clearing of the close-in and minor obstacles, are left to the specially organized, trained, and equipped infantry squads which lead the attack. After the fortified line has been breached, rapid construction and maintenance of routes into and through the gap are the primary tasks of the engineers. Engineers also render captured forts and pillboxes unsuitable for reoccupation (fig. 59) when ordered by authority competent to determine those installations will not be needed by friendly troops. Engineers accompany attack units in the assault of successive fortified positions. Additional engineers assist other units which follow up the penetration and fan out in pursuit and exploitation in the enemy rear area.

b. In an assault, engineer elements are placed in direct support of the leading infantry units and units which continue the penetration through additional wire and mine fields, and fortified positions. Other engineers are in general support of the entire operation. Engineers with the exploiting or encircling force are attached and must have the same degree of mobility as the units they accompany.

c. Before the assault begins, a detailed engineer study is made of the terrain, bridges, routes of communications, and artificial obstacles such as mine fields, tank traps, and emplacements. The technique of attack and the requirements for engineer personnel, supplies, and subsequent reconstruction are planned from this study. The information for such a study is obtained from ground and aerial reconnaissance, and a careful study of available maps.



Figure 59. Dozer seals off a pillbox in Siegfried Line.

d. Since the techniques for an operation of this type are so specialized, involving teams of combined arms, and such close coordination is required between the participating units, complete rehearsals must precede the actual operation.

e. Details on the technique of passing various types of obstacles and conduct of the assault are given in FM's 5-31, 31-50, and 100-5, and TM 5-220.

267. MOUNTAIN OPERATIONS

a. The major engineer problem in mountain operations is maintenance and construction of roads and bridges. Mine warfare is also important because of the limitation of off-road movement. On the offensive, reconstruction is a major job; for in their retreat, the enemy will probably destroy rock cuts, long fills, retaining walls, cliff roads, tunnels, and bridges. On the defensive or in a retrograde movement, our own engineers may be required to perform the same denial operations. In addition, in a withdrawal, the destruction of bridges, dams, power lines, telephone lines, cableways, and aqueducts supported on trestles or towers will effectively hamper the advancing enemy.

b. The maintenance and construction of roads is one of the major engineer problems in mountain operations. Initial plans are based upon the existing roads with a view to repairing and improving them. New construction is first limited to trails which may later be improved into roads carrying vehicle traffic. Routes are selected with special regard to cover and

to the speed with which the roads can be put into service. New roads generally follow the contour lines and are kept off the ridges so traffic is not silhouetted against the skyline. On sidehills, every advantage is taken of natural routes, to reduce the amount of cutting and cribbing necessary to hold the road foundation. Special attention is given to drainage, since spring thaws and heavy rains will wash out poorly constructed roads. The maintenance and repair of mountain roads necessitates much cutting, filling and cribbing. However, where sidehill cuts must be replaced, the best and quickest solution is often the use of timber and panel bridges. The air compressor, angledozer, and grader are used as much as possible but the extensive use of hand tools may become necessary. Culverts and fills are substituted for bridges wherever possible. Tramways, cableways (figs. 60 and 61), and rope bridges are expedients which are used to advantage in mountain terrain.

c. In addition, jobs such as reconnaissance, water supply, laying and breaching of mine fields, construction of fortifications, and demolitions are performed by the engineers. Camouflage is easy and effective in mountainous terrain, however, it can be exposed by infrared photography.

d. Special training in mountain operations is usually necessary because of the characteristics of the terrain and the severity of the weather.

e. Additional information on mountain operations, training, and the particular problems involved is contained in FM's 5-10, 70-10, and 100-5.

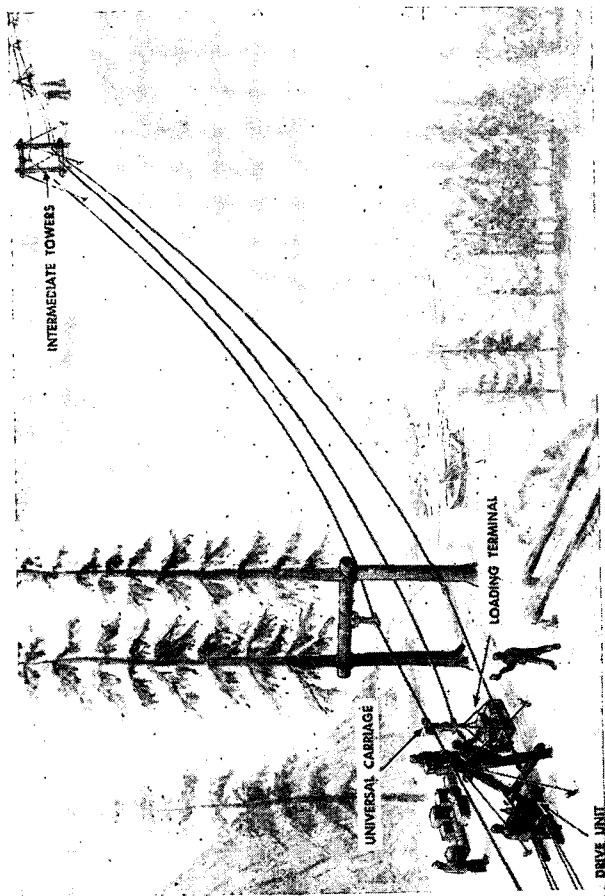


Figure 60. Pioneer tramway.

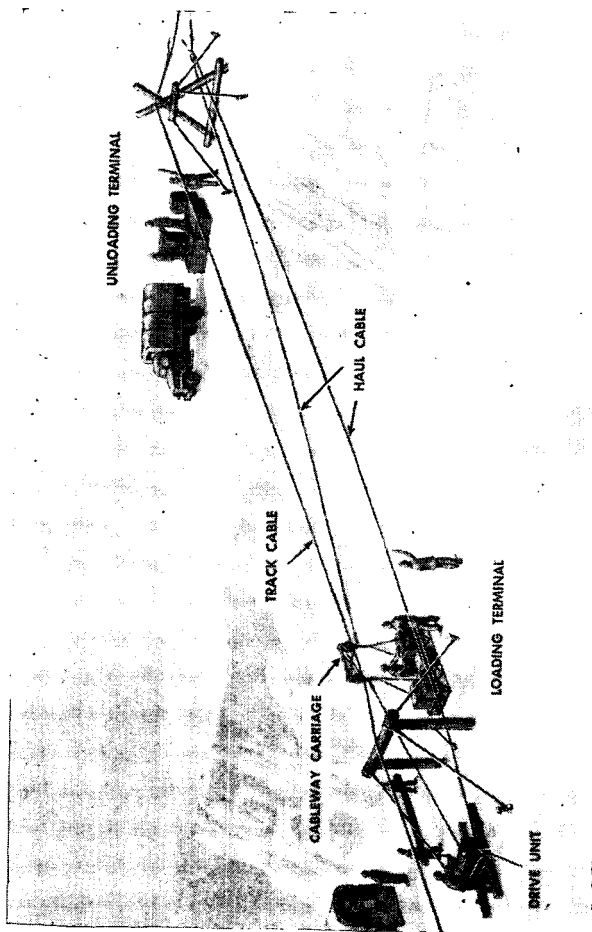


Figure 61. Pioneer cableway.

268. OPERATIONS IN SNOW AND EXTREME COLD

a. Extreme cold and great quantities of ice and snow create special engineer problems in these operations. Snow and ice tend to limit the mobility of a force by confinement of route, by natural obstacles, by failure of equipment, and by discomfort and discouragement of troops. In arctic and subarctic regions, the routes of travel are more varied in winter, while summer is the period of restricted movement. It is the duty of the engineers to maintain mobility and to do as much for the comfort of the troops as possible. This appreciably increases the task of the engineers, while at the same time demanding the utmost economy of tools and material.

b. For operations in snow and extreme cold special equipment and special techniques are required. See FM's 5-10, 5-31, 70-15, and 100-5, and special augmentation tables for applicable T/O & E's.

269. JUNGLE OPERATIONS

a. The characteristics of jungle climate and terrain emphasize certain engineer problems. These are—

- (1) Maintaining equipment.
- (2) Constructing and maintaining routes of communications. The jungle may be defined as that dense growth including underbrush, trees, vines, grass, and giant ferns, found below the timber line in most humid tropical areas.

b. In jungle operations, the engineer information most needed is:

- (1) Location and condition of roads and trails.

- (2) Location of road-construction material.
- (3) High-water level of streams.
- (4) Condition of banks at river-crossing sites.
- (5) Drainage conditions favorable to malaria-carrying mosquitoes.
- (6) Location of water points for drinking, washing, and bathing water.

c. Securing information is particularly difficult under jungle conditions because:

- (1) The dense growth restricts observation on the ground to only a few feet.
- (2) Aerial observation is limited.
- (3) Patrols are small—of only a few men.
- (4) Vehicles can seldom be used on reconnaissance missions.
- (5) Movement makes birds and animals flee, thus giving warning of approaching troops.

d. Progress through the thick jungle undergrowth, except along a few existing trails, is very slow and laborious. Often a path can be hacked out only with the greatest difficulty, and columns of troops are in great danger of being attacked from the flanks, or isolated and surrounded. Watercourses, either relatively flush with the adjacent terrain or following deep, precipitous gulches, further hinder progress (fig. 62). In mountainous terrain, streams that are normally shallow may become raging torrents within a short time after a heavy rain.

e. Because of the poor quality of trails and roads, their insufficient number, or their complete absence, the rate of movement of troops depends on the ability of the engineers to improve or construct them. In building roads and trails special care must be taken



Figure 62. Expedient footbridge in New Guinea.

to achieve the best possible drainage. Local expedients are used to a large extent (fig. 63).

f. Untreated-timber bridges rot very rapidly in the jungle and are also vulnerable to termites. For these reasons a large safety factor should be included in their design and construction. Bridges are in danger of being washed out by flash floods. Special care must be taken to build against this possibility.

g. Because of the cover afforded by the jungle, troops can be brought up with great secrecy for a river crossing; however, road conditions usually prevent bringing up of heavy bridging equipment. Fords cannot be depended upon for crossing troops, since rains can make the fords impassable in a short time.

h. Defensive positions to stop infantry assaults are best laid out as explained in FM 5-15. Barbed wire tied to natural undergrowth well-sprinkled with antipersonnel mines makes a formidable barrier to infantry. The best obstacle to vehicular and tank movement is the jungle itself. Mine warfare is restricted to narrow bands on roads and occasional normal fields in open areas.

i. Bivouac areas are selected to have maximum drainage and to be as free as possible from rats, malaria mosquitoes, flies, fleas, mites, and lice.

j. Water is usually very abundant, but a special problem exists in water inhabited by the liver fluke, the cause of schistosomiasis. Bathers are particularly vulnerable to this disease, as are water supply personnel who handle the raw water from the source. Untreated water should never be drunk because of pollution.



Figure 63. Expedient road construction by engineers in New Guinea.

k. Camouflage is needed only for very close contact with the enemy. The use of leaves and branches on uniforms and the darkening of exposed white skin areas are all that are needed. Camouflage jungle suits are also used.

l. Maps of jungle areas are scarce, and those available are usually very inaccurate except in the delineation of coast lines and principal rivers.

m. Communication in the jungle is restricted mostly to messengers and telephone. Even patrols may carry and lay wire. The usefulness of radio is reduced by the screening effect of the jungle.

n. Special problems in troop morale and health arise because of the excessive heat, humidity, prevalence of tropical diseases, and oppressiveness of the jungle. Special efforts must be made to counteract these if operations in the jungle are to be successful.

o. Additional information on jungle operations may be found in FM's 5-15, 72-20, and 100-5.

270. DESERT OPERATIONS

a. Desert operations are generally the same as in semiarid hilly or flat terrain with a wide range in temperature. Special engineer problems do arise, however, because of the scarcity of water, the lack of natural concealment, and the unrestricted mobility of all types of vehicles except in the deep sandy areas.

b. Both air and ground reconnaissance are limited only by enemy activity and darkness. Reconnaissance for water supply sources and for enemy mine fields are major engineer tasks.

c. There are but few roads in the desert to maintain or build, hence repair is a minor problem. How-

ever, maintenance and evacuation of engineer equipment is of major importance.

d. Except in mountainous regions bridges are rarely necessary. Standard fixed bridging may be used over dry stream beds, and in the exceptional case, standard floating bridges over a stream.

e. If a dry stream bed or wadi becomes flooded, troops wait for the flash flood to pass, then cross. If it becomes necessary to cross a river such as the Nile, the operation is conducted as discussed in section VII of this chapter.

f. Fortifications can usually be bypassed in the desert. Road blocks are ordinarily useless. Extensive mine fields hinder movement and may be used to canalize enemy attacks into areas where other obstacles exist. Control of water sources can do much toward defeating the enemy.

g. The most difficult and most important mission of the engineers is water supply. It requires continuous and intensive water reconnaissance. Water supply personnel must exercise great care in preparing, storing, and issuing water. Transportation of water from water supply points to water disposition points may involve long hauls for which the engineers are responsible. Strict water discipline must be enforced by all echelons. A well-guarded pipeline may be set up and used. The necessity for dispersion of troops requires the use of many distribution points. An adequate reserve of water transportation facilities must be maintained to cover all contingencies. The division engineer water section will normally be reinforced with other troops from the engineer battalion.

h. Lack of natural concealment in the desert places special emphasis on camouflage. Protective painting, slow movements, and the covering of all shiny objects are more effective than large camouflage installations. Deceptive measures are of great importance. Many dummy installations should be built. Realism can be maintained by overnight changes of location. It is impossible to conceal tracks, except on rocky ground. To avoid converging tracks, which disclose locations of important installations such as command posts and water supply points, vehicles follow designated routes when approaching these localities. Mine-field locations are often disclosed by the abrupt turns made by vehicles in avoiding the fields. Proper control of such tracks can be used to deceive enemy air observers.

i. The digging in of vehicles in bivouac is important. All trucks should be dug in up to the hood and tanks up to the top of the tracks. This is especially important when natural concealment is utterly lacking and the bivouac or area is within enemy artillery range. Artillery shell fragments do much damage to tires, motors, and bodies. The digging in of vehicles prevents this damage except when the enemy is firing proximity fuzed projectiles. The tank dozers of the engineer combat battalion, divisional, are ideally suited for doing this work in a relatively short time.

j. Additional information on desert operations can be found in FM's 5-31, 31-25, and 100-5.

APPENDIX I

REFERENCES

1. PUBLICATIONS INDEXES

The following publications should be consulted frequently for latest changes to, or revisions of, the publications given in this list of references, and for new publications on the subjects covered in this manual:

- | | |
|-------------|--|
| SR 110-1-1 | Index of Army Motion Pictures and Film. |
| SR 310-20-3 | Index of Training Publications (Field Manuals, Training Circulars, Firing Tables and Charts, Army Training Programs, Mobilization Training Programs, Graphic Training Aids, Joint Army-Navy Air Force Publications, and Combined Communications Board Publications). |
| SR 310-20-4 | Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, |

- Lubrication Orders,
Modification Work Orders,
Tables of Organization and Equipment,
Reduction Tables,
Tables of Allowances,
Tables of Organization,
and Tables of Equipment.
- SR 310-20-5 Index of Administrative Publications (Army Regulations, Special Regulations, Joint Army-Air Force Adjustment Regulations, General Orders, Bulletins, Commercial Traffic Bulletins, Joint Procurement Circulars, Department of the Army Pamphlets, and ASF Manuals).
- SR 310-20-6 Index of Blank Forms and Army Personnel Classification Tests.
- SR 320-5-1 Dictionary of U. S. Army Terms.
- SR 320-50-1 Military Terms, Abbreviations, and Symbols, Authorized Abbreviations.
- FM 21-8 Military Training Aids.

2. ARMY REGULATIONS

AR 40-205	Military Hygiene and Sanitation.
AR 60-5	Chaplains; General Provisions.
AR 105-15	Field Signal Communications.
AR 220-60	Battalions—General Provisions.
AR 220-70	Companies—General Provisions.
AR 300-15	Mapping and Charting.
AR 345-105	Records and Reports, Command Report (Reports Control Symbol CSGPO-28)
AR 380-5	Safeguarding Military Information.
AR 700-105	Motor Vehicles.
AR 750-5	Maintenance, Responsibility and Shop Operation.

3. FIELD MANUALS

FM 3-5	Characteristics and Employment of Ground Chemical Munitions.
FM 3-15	Supply and Field Service.
FM 3-50	Large Area Smoke Screening.
FM 5-10	Routes of Communication.
FM 5-15	Field Fortifications.
FM 5-20	Camouflage, Basic Principles.

FM 5-25	Explosives and Demolitions.
FM 5-31	Land Mines and Booby Traps.
FM 5-32	Land Mine Warfare.
FM 5-34	Engineer Field Data.
FM 5-35	Reference Data.
FM 6-20	Field Artillery Tactics and Technique.
FM 6-101	Tactics and Technique, Battalion and Battery, Motorized.
FM 7-10	Rifle Company, Infantry Regiment.
FM 7-15	Heavy Weapons Company, Infantry Regiment.
FM 7-20	Infantry Battalion.
FM 7-24	Communication in the Infantry and Airborne Division.
FM 7-25	Headquarters Company, Infantry Regiment.
FM 7-30	Service and Medical Companies Infantry Regiment.
FM 7-35	Tank Company Infantry Regiment.
FM 7-40	Rifle Regiment.
FM 8-10	Medical Service of Field Units.
FM 8-35	Transportation of the Sick and Wounded.

FM 9-6	Ammunition Supply.
FM 17-32	Tank Platoon and Tank Company.
FM 19-5	Military Police.
FM 20-100	Army Ground Forces Light Aviation.
FM 21-5	Military Training.
FM 21-10	Military Sanitation.
FM 21-11	First Aid for Soldiers.
FM 21-25	Elementary Map and Aerial Photograph Reading.
FM 21-26	Advanced Map and Aerial Photograph Reading.
FM 21-30	Military Symbols.
FM 21-105	Engineer Soldier's Handbook.
FM 22-5	Drill and Ceremonies.
FM 22-10	Leadership.
FM 24-6	Radio Operator's Manual, Army Ground Forces.
FM 24-17	Communication Center Operation.
FM 24-18	Field Radio Techniques.
FM 24-20	Field Wire Technique.
FM 25-10	Motor Transport.
FM 26-5	Interior Guard Duty.
FM 30-5	Military Intelligence—Combat Intelligence.
FM 30-10	Military Intelligence—Observation.
FM 30-15	Examination of Personnel and Documents.

FM 30-20	Military Intelligence—
FM 30-21	Military Maps.
FM 31-25	Aerial Photography Military Application.
FM 31-50	Desert Operations.
	Attack on a Fortified Position and Combat in Towns.
FM 31-70	Basic Arctic Manual.
FM 31-71	Operations in the Arctic.
FM 70-10	Mountain Operations.
FM 70-15	Operations in Snow and Extreme Cold.
FM 72-20	Jungle Warfare.
FM 100-5	Operations.
FM 100-10	Administration.
FM 101-5	Staff Organization and Procedure.
FM 101-10	Organization, Technical, and Logistical Data.

4. TECHNICAL MANUALS

TM 5-220	Passage of Obstacles Other Than Mine Fields.
TM 5-223A	Soviet Mine Warfare Equipment.
TM 5-223B	European Mine Warfare Equipment.
TM 5-225	Rigging and Engineer Hand Tools.
TM 5-226	Carpentry.
TM 5-235	Special Surveying.

TM 5-236	Surveying Tables.
TM 5-240	Aerial Phototopography.
TM 5-246	Interpretation of Aerial Photographs.
TM 5-248	Foreign Maps.
TM 5-252	Use of Road and Airfield Construction Equipment.
TM 5-261K	Bridge Model Training Aid Kit Floating Bridge M4 and M4A2.
TM 5-267	Camouflage.
TM 5-271	Light Stream-Crossing Equipment.
TM 5-272	Steel Treadway Bridge M2.
TM 5-278	Outboard Motors.
TM 5-280	Construction in the Theater of Operations.
TM 5-295	Military Water Supply and Purification.
TM 5-296	Ground Water Supply for Military Operations.
TM 5-560	Arctic Construction. (under preparation).
TM 9-722	Tank-Mounting Bulldozer M2.
TM 12-205	The Army Postal Service.
TM 12-250	Administration.
TM 16-205	The Chaplain.
TM 20-350	General Safety Manual.
TM 21-305	Driver's Manual.

TM 37-2810

Motor Vehicle Inspection
and Preventive Maintenance Services.

TM 71-210

Air Transport of Troops
and Equipment.

APPENDIX II

TYPICAL SOP

RECOMMENDED OUTLINE FOR AN SOP (To be used as a check list)

HEADQUARTERS
—th ENGINEER COMBAT BATTALION,
DIVISIONAL APO — US ARMY

DATE

STANDING OPERATING PROCEDURE

TABLE OF CONTENTS (List paragraph numbers and titles)

Section I. GENERAL

- 1. APPLICATION** (to operations, relation to prior SOP's, lower units to conform).
- 2. PURPOSE.**
- 3. REFERENCES** (AR's, SR's, FM's, TM's).
- 4. RESPONSIBILITY FOR SOP** (preparation, changes, and revisions).
- 5. EFFECTIVE DATE.**

Section II. COMMAND, STAFF AND LIAISON

6. ORGANIZATION.

- a.* Normal.
- b.* Special internal attachments and organization.

- c.* Normal and special, external attachment and support (RCT's, etc.).
- 7. COMMAND POSTS.
 - a.* Normal location (in relation to next higher headquarters).
 - b.* Reporting change of location (coordinates and time).
 - c.* Forward CP's.
 - (1) When (situation for which required).
 - (2) How (organized).
 - (3) Personnel and equipment.
- 8. STAFF DUTIES.
 - a.* Special or additional duties to those in FM's 101-5 and 5-132.
 - b.* Duties of such other important special staff officers as the commander desires to prescribe (paragraph for each).
- 9. LIAISON (FM's 101-5 and 5-132).
 - a.* Duties of liaison officers.
 - b.* Responsibilities for liaison. (With next higher, lower, and adjacent units.)

Section III. ADMINISTRATION

- 10. GENERAL (Channels) (TM 12-255)
- 11. REPORTS.
 - a.* Routine.
 - b.* Special.
 - c.* Information concerning submission of reports.
 - (1) Title and reports control symbol.
 - (2) Form for report.
 - (3) Date due.
 - (4) Number of copies.
 - (5) Negative report required or permissible.

12. PROMOTIONS (Policies).
 - a.* Officer (AR's 605-40, 605-12, SR 140-155-1).
 - b.* Enlisted (SR 140-157-1).
 - c.* Battlefield.
13. COURTS-MARTIAL (MCM, US 1951).
 - a.* Local jurisdiction.
 - b.* Procedure for submitting cases.
14. MAIL (AR 340-15, SR's 340-10-1, 65-160-5).
 - a.* Handling of official mail.
 - b.* Handling of personal mail.
15. LEAVES AND PASSES (AR 600-115).
 - a.* Policy of command (frequency, conduct, VD policies, etc.).
 - b.* Authority to grant.
16. JOURNALS AND HISTORY (AR 345-105, SR 345-105-1).
 - a.* Responsibility for unit journal and history.
 - b.* Maintenance of staff section journals.
17. DISTRIBUTION OF MILITARY PUBLICATIONS (AR 310-90, SR 310-90-1).
18. HANDLING OF PRISONERS OF WAR (SR 535-10-5).
 - a.* Reference to FM 27-10.
 - b.* Special instructions for capturing units.
19. AWARDS AND DECORATIONS (AR's 260-15, 600-45, SR 600-45-1).
 - a.* Channels.
 - b.* Forms.
 - c.* Presentation.
20. ORDERS (FM 101-5).
 - a.* Combat orders.
 - b.* Memoranda of combat orders to S3.

21. BILLETS AND BIVOUACS.

- a.* Billeting policies (occupation and vacating).
- b.* Billeting party (organization and duties).

Section IV. MOVEMENT.

22. GENERAL (Reference Division SOP and march order).

23. MOTOR MOVEMENT (FM 25-10).

- a.* Preparation of vehicles.
- b.* Motor marches.
 - (1) Strip maps.
 - (2) Route reconnaissance.
 - (3) Messing and refueling.
 - (4) Night marches.
 - (5) Make up of march units and serials.
 - (6) Distances to be maintained.
 - (7) Speeds and rate of march.
 - (8) Posting of traffic guards during halts.
- c.* Conduct of personnel during movement.
- d.* Maintenance on marches and movements.
- e.* Conduct of personnel during movement.

24. VEHICLE AND EQUIPMENT REGULATIONS.

a. Motor Pool (AR 700-105).

- (1) Dispatch.
- (2) Service.
- (3) Maintenance.

b. Regulations for administrative vehicles.

25. RAIL MOVEMENTS (AR's 55-130, 55-135, 55-145).

a. Action by S1.

- (1) Movement policy.

- (2) Troop lists.
 - (3) Designation of movement control personnel.
- b.* Action by S2.
 - (1) Railroad reconnaissance report.
 - (2) Security.
- c.* Action by S3.
 - (1) Determine rolling-stock requirements.
 - (2) Coordinate loading plans.
 - (3) Prepare loading schedule and designate areas.
- d.* Action by S4.
 - (1) Initiate transportation requests.
 - (2) Troop and guard mess.
 - (3) Procurement of blocking and dunnage.
 - (4) Prepare shipping documents.
- 26. AIR MOVEMENT (FM's 100-20, 31-40).
 - a.* Action by S1 (same as par. 25*a*).
 - b.* Action by S2.
 - Security.
 - c.* Action by S3.
 - (1) Determine type of craft required.
 - (2) Coordinate loading plans.
 - (3) Prepare loading schedule and designate loading areas.
 - (4) Instruct all personnel in air transportability technique.
 - d.* Action by S4.
 - (1) Initiate transportation requests.
 - (2) Assure availability of tie-down devices or material.
 - (3) Furnish weights of equipment for loading computation.

(4) Arrange for any necessary Air Force supplies.

(5) Prepare shipping documents.

27. **WATER MOVEMENT** (AR 55-305, 55-390, SR 55-720-1).

a. Action by S1 (same as par 25*a*).

b. Action by S2 (same as par 26*b*).

c. Action by S3.

(1) Determine shipping required.

(2) Coordinate loading plans.

(3) Prepare loading schedule and designate loading areas.

d. Action by S4.

(1) Initiate transportation requests.

(2) Provide for troop mess.

(3) Prepare shipping documents.

28. **FOOT MARCHES** (FM's 7-10, 7-20, 7-40).

Section V. **SECURITY**

29. **GENERAL** (policy and responsibilities) (FM 26-5).

30. **SECURITY DURING MOVEMENT.**

a. Air guards.

b. Manning of vehicular weapons.

c. Camouflage during halts.

d. Advance, flank, and rear guards.

e. Action in case of attack.

(1) Air.

(2) Mechanized.

(3) Atomic, bacteriological, and chemical.

31. **SECURITY IN BIVOUAC** (FM's 5-20c, 5-31, 7-10, 31-20).

a. Camouflage.

- b.* Mines and booby traps.
- c.* Placement of weapons for:
 - (1) Air attack.
 - (2) Mechanized attack.
 - (3) Troops and guerrillas.
- d.* Joint security.
- e.* Security plans.
- f.* Sentry posts and outposts.

32. REAR AREA OBSERVATION (FM's 7-10, 7-20).

- a.* Formation of rear area observation groups.
- b.* Selection of rear area observation posts.
- c.* Twenty-four hour manning of posts.
- d.* Observation of rear area, when required.
- e.* Communications for observation posts.

33. SECURITY OF WORKING PARTIES.

- a.* Responsibility.
- b.* Camouflage of equipment.
- c.* Combat readiness.

34. SECURITY WARNING SIGNALS.

- a.* Air attack.
- b.* Airborne attack.
- c.* Mechanized attack.
- d.* Gas attack.
- e.* Atomic, bacteriological and chemical attack.

35. FIRE SAFETY AND FIREFIGHTING (SR 420-510-10).

- a.* Plan (general).
- b.* Fire personnel and duties.
- c.* Safety rules (motorpools, kitchens, etc.).

36. ALERT PLANS.

- a.* Unit plans.
- b.* Alert roster.

- c.* Armament and equipment.
- d.* Phase system for alert warnings.

Section VI. COMMUNICATION

37. TYPES USED.

38. COMMUNICATION BETWEEN UNITS (TM's 11-462, 24-205, 24-210, FM's 24-22).

- a.* Radio.
- b.* Telephone (TM 24-210).
- c.* Responsibility for installation.
- d.* Visual (FM 24-22).

39. COMMUNICATION PROCEDURES.

- a.* Radiotelephone voice procedure (CCBP 3-2).
- b.* Signal security.
- c.* Citation of SOI and SSI of higher headquarters.

40. MAINTENANCE RESPONSIBILITIES OF COMMUNICATION OFFICER (FM's 100- 11, 7-25).

Section VII. RECONNAISSANCE, INTELLIGENCE, AND COUNTERINTELLIGENCE

41. RECONNAISSANCE.

- a.* Reconnaissance a continuing function.
- b.* Essential elements of engineer information.

42. ENGINEER INTELLIGENCE.

- a.* Evaluation.
- b.* Preparation of reports.
- c.* Dissemination.

43. COMBAT INTELLIGENCE (FM 30-5).

- a.* Definition of "spot report".
- b.* "Spot reports" required.

- (1) Initial contact with enemy.
- (2) Marked changes in enemy disposition or situation.
- (3) Attack by armored, aircraft, or airborne forces.
- (4) New units identified.
- (5) Enemy strength, composition, and movement.
- (6) Location of enemy installations.
- (7) Use of chemicals or new weapons.
- (8) New enemy materials or equipment.

44. COUNTERINTELLIGENCE.

- a.* Mail censorship.
- b.* Blackout discipline.
- c.* Extent of information given, if captured.
- d.* Signs and countersigns.
- e.* Destruction of classified material.
- f.* Civilian control.
- g.* Secrecy discipline.
- h.* Information to press representatives.

Section VIII. SUPPLY

45. CLASS I.

- a.* Ration pick-up.
- b.* Daily ration return and ration cycle.
- c.* Reserve rations carried.
 - (1) By unit.
 - (2) By individual.
- d.* Responsibility for attached units.

46. WATER.

- a.* Authorized sources.
- b.* Purification by expedient methods.
- c.* Water economy.

47. CLASS II AND IV.

- a.* Requisition days for various services.
- b.* Pick-up procedure.
- c.* Salvage turn-in procedure.
- d.* Dropage by "Battle Loss Certificate."

48. CLASS III.

- a.* Method of supply.
- b.* Fuel sources.

49. CLASS V.

- a.* Method of requisitioning.
- b.* Forms used and certificates required.
- c.* Basic load.
- d.* Salvage.

50. MAINTENANCE OF VEHICLES AND EQUIPMENT (TM 37-2810).

- a.* Echelons of maintenance.
- b.* Maintenance officer's responsibilities.
- c.* Forms used.
- d.* Priorities.

51. REPAIR PARTS.

- a.* Method of requisitioning; engineer, and ordnance.
- b.* Maintenance of stock levels.
- c.* Inspections for maintenance and stock levels.
- d.* Parts and equipment records.

52. EVACUATION OF VEHICLES AND EQUIPMENT.

- a.* Engineer channels.
- b.* Ordnance channels.

53. PURCHASE AND PROCUREMENT (SR 715-5-20, AR 35-6300).

- a.* Designation and duties of P&C Officer.

- b.* Procedures and channels.
- c.* Items and services (include real estate).

Section IX. REORGANIZATION FOR COMBAT

- 54. REORGANIZATION (general).
- 55. DESIGNATION OF FORWARD ECHELON.
 - a.* Personnel.
 - b.* Equipment.
- 56. DESIGNATION OF REAR ECHELON.
 - a.* Personnel.
 - b.* Equipment.
- 57. SUPPLY (TM 9-1900 and SR 700-310-1).
 - a.* Ammunition.
 - b.* Unit trains.
- 58. COMMUNICATION.
- 59. MEDICAL EVACUATION (FM's 7-30, 8-35).
- 60. STATEMENT OF EFFECT ON NORMAL MISSION.

BY ORDER OF LT. COLONEL SPRING

/s/ JOHN O. FORD
/t/ JOHN O. FORD
Capt. CE
Adjutant.

OFFICIAL:

/s/ JOHN O. FORD
/t/ JOHN O. FORD
Capt. CE
Adjutant

DISTRIBUTION:

RECOMMENDED ANNEXES

1. Wearing of the uniform.
2. Signs.
3. Format for "Daily Engineer Situation Report."
4. Billets and bivouacs.
5. Destruction of classified documents.
6. Staff section SOP's.
7. Headquarters and headquarters and service company loading plan.
8. Reorganization for combat.
9. Alert plan.
10. March table.
11. Battalion radio net.

APPENDIX III

TYPICAL REORGANIZATION OF ENGINEER COMBAT BATTALION, DIVISIONAL, FOR COMBAT AS INFANTRY

Section I. GENERAL

1. **PURPOSE:** To establish a guide for the reorganization of the battalion prior to engagement as infantry. The reorganization is designed to better prepare the battalion and its components for a combat role through the most judicious use of personnel, equipment, and organic weapons.

2. **ALERT:** All personnel of the battalion are alerted as soon as orders are received from higher headquarters to commit the battalion as infantry. Upon receipt of such an alert this reorganizational plan becomes effective. Each company commander prepares an SOP designed to effect the reorganization detailed in the battalion SOP.

3. **WEAPONS:** All individual and crew-served weapons organic to the battalion, to include the assault platoon, are utilized. In such an emergency, it cannot be assumed that additional weapons will be available for issue to the engineer battalion.

4. **ENGINEER WORK:** When the battalion is committed as infantry, all engineer work except engineer supply, map supply, water supply, and limited engineer reconnaissance is discontinued.

5. **TRAINING**: During all combat training exercises this plan is effective.

6. **SUPPORT FIRE**: See paragraph 262.

7. **COMMUNICATION**: See paragraph 262.

8. **ECHELONS**: See paragraph 261.

9. **INDIVIDUAL EQUIPMENT**: Each individual prepares full field equipment for retention. All other individual equipment is stored by the battalion rear echelon until released by the battalion commander.

Section II. REORGANIZATION OF THE ENGINEER COMBAT SQUAD

10. **REAR ECHELON**: The squad driver is assigned to the rear echelon. The squad truck, trailer, tools, and individual equipment are assigned to the rear echelon.

INFANTRY JOB	WEAPON	ENGINEER JOB
1. Squad Ldr	Rifle	Squad Ldr
2. Rifleman	Rifle & Grenade Lchr	Combat Const. Spec
3. Rifleman	Rifle	Pioneer
4. Rifleman	Rifle	Pioneer
5. Rifleman	Rifle	Combat Const. Spec
6. Asst Rkt Lchr Gunner	Rifle	Equip. Operator
7. Rkt Lchr Gunner	Rifle & Rkt Lchr	DML Spec
8. Asst Squad Ldr	Rifle & Grenade Lchr	Asst Squad Ldr

Figure 64. Typical reorganization of the engineer combat squad.

11. **FORWARD ECHELON:** Three men are released to platoon headquarters for organization of a provisional weapons squad. The remaining eight men are organized into a rifle squad as shown in figure 64. The third squad releases its rocket launcher to the platoon weapons squad.

Section III. REORGANIZATION OF ENGINEER COMBAT PLATOONS

12. **REAR ECHELON:** *a. Squads.* See section II above.

b. Platoon Headquarters. The driver of the platoon truck, the truck, trailer, platoon tools, and .50 cal. machine gun are assigned to the rear echelon. The platoon toolroom keeper takes charge of the platoon rear echelon and reports all vehicles to the commander of the company rear echelon. The toolroom keeper and platoon truck driver man the .50 cal. machine gun for AA defense of the vehicles.

13. **FORWARD ECHELON:** *a. Squads.* See figure 64 above.

b. Platoon Headquarters. Platoon headquarters consists of the platoon commander, platoon sergeant, messenger, radio operator (truck driver), and 1/4-ton truck. See figure 65. The assistant platoon sergeant becomes the squad leader of the weapons squad.

c. Weapons squad. The provisional weapons squad consists of the squad leader, two three-man machine gun crews, and a two-man rocket launcher team. The two .30 cal. machine guns are organic platoon weapons; the rocket launcher is from the third squad. See figure 65.

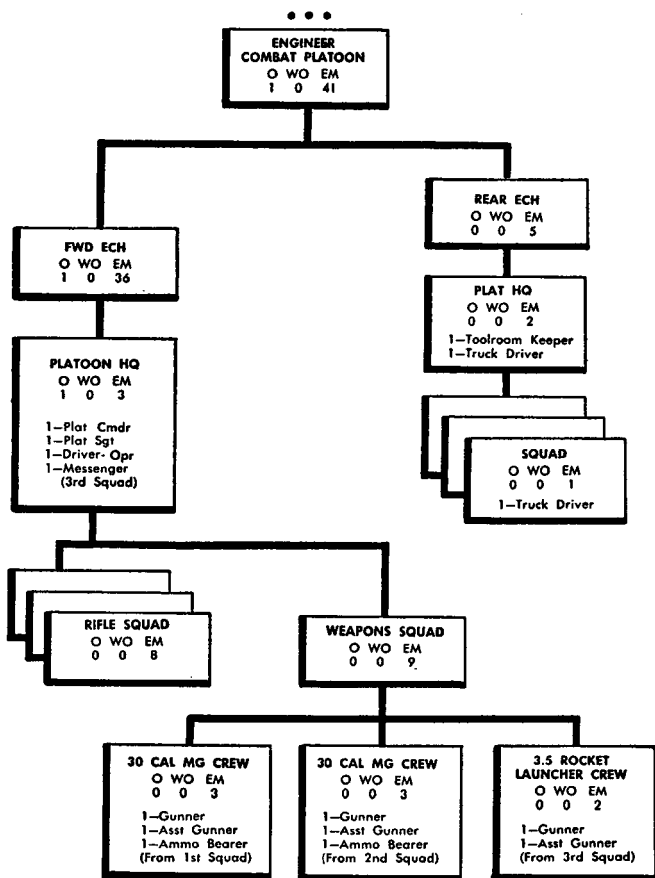


Figure 65. Typical reorganization of the engineer combat platoon.

Section IV. REORGANIZATION OF THE ENGINEER COMBAT COMPANY

14. REAR ECHELON. *a. Personnel.* The company rear echelon is under command of the unit administrator. It consists of the warrant officer and 21 men from company headquarters and 15 men from the combat platoons (fig. 66). The personnel from company headquarters are:

(1) *Administrative section:* (2) Unit administrator and company clerk.

(2) *Supply section:* (2) Supply specialist and light truck driver.

(3) *Mess section:* (7) Entire section.

(4) *Equipment and maintenance section:* (9) Entire section, less the electrician.

b. Equipment: Major items of company headquarters equipment in the rear echelon are:

2 trucks, 2½-ton 6 x 6 (supply and mess).

1 trailer, water (mess).

1 truck, ¾-ton, 4 x 4 (supply and mess).

1 trailer, 1-ton cargo (supply).

1 truck-tractor, 6-ton (equip and maint).

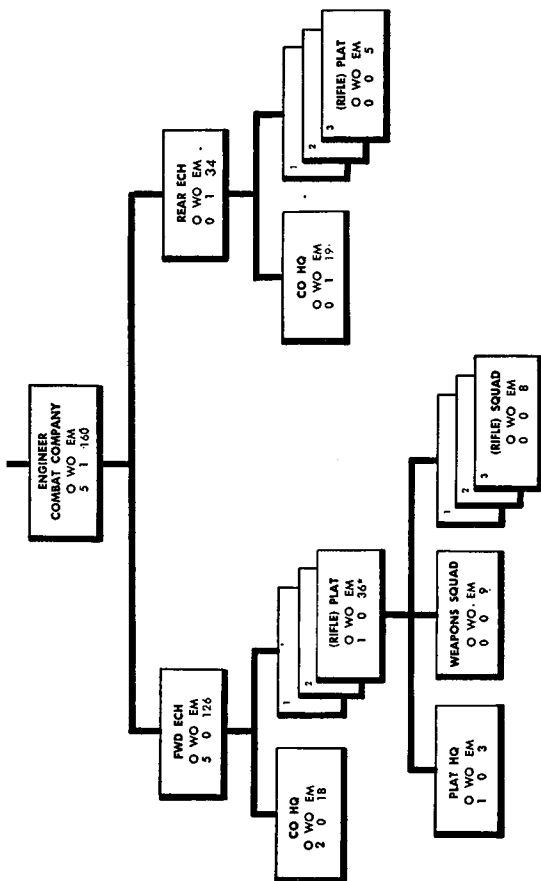
1 trailer, semi, 20-ton (equip and maint).

1 tractor, w/angle dozer (equip and maint).

1 compressor, air, trk mtd (equip and maint).

c. Platoons: The company rear echelon also includes 3 platoon tool trucks with cargo trailers, .50 cal. MG's, drivers, and toolroom keepers, and 9 squad trucks with drivers and pole type trailers.

d. Operation: When the entire battalion is reorganized for combat, the company rear echelon becomes part of the battalion rear echelon. On a sep-



*PLUS COMPANY AID MEN AND LITTER BEARERS, AS REQUIRED.

Figure 66. Typical reorganization of the engineer combat company.

arate combat mission, the company establishes its own rear echelon. In any event, the mission for the rear echelon is to support the company operations and provide its own security.

15. **FORWARD ECHELON:** *a. General.* The forward echelon of company headquarters consists of 2 officers and 18 enlisted men organized into command, supply, and communication sections.

b. Command section. (12) The company commander, executive officer, 1st sergeant, eight fillers, and a light-truck driver with a $\frac{1}{4}$ -ton truck.

c. Supply section. (3) The company supply sergeant, armorer, light-truck driver and $\frac{3}{4}$ -ton truck.

d. Communication section. (5) Three radio operators, a radio mechanic, an electrician, and a $\frac{3}{4}$ -ton truck. One of the radio operators drives the truck.

e. Medical attachment. One aid man from the battalion medical attachment accompanies each platoon. Litter bearers are drawn from the company fillers or the rear echelon, as required.

f. Support fire. See paragraph 262.

Section V. REORGANIZATION OF HEADQUARTERS, HEADQUARTERS AND SERVICE COMPANY

16. **HEADQUARTERS AND SERVICE COMPANY:** *a. Rear echelon.* The rear echelon of the headquarters and service company is located with, and provides the command for, the battalion rear echelon. The company commander is also designated as the battalion rear echelon commander. His mission is to support the battalion forward echelon with men and materials; to provide command, ad-

ministration, and security; and to coordinate operations of the battalion rear echelon. Company rear echelon consists of two officers, two warrant officers, and 72 enlisted men (fig. 67) to include the:

(1) *Administration section.* (4) The company commander, the driver, and $\frac{1}{4}$ -ton truck, the unit administrative warrant officer, and company clerk.

(2) *Supply section.* (2) Supply specialist, supply truck driver and $2\frac{1}{2}$ -ton truck.

(3) *Mess section.* (10) Entire section with mess truck and water trailer.

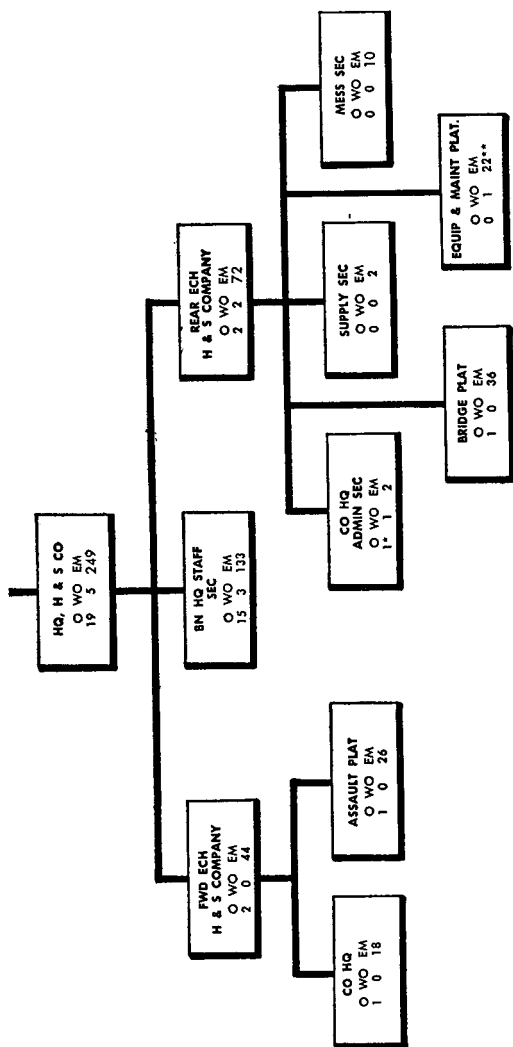
(4) *Equipment and maintenance platoon.* (23) All, except 10 men sent forward with the battalion communication section. All equipment and vehicles remain with the rear echelon.

(5) *Bridge platoon.* (37) Entire platoon with equipment and vehicles. Trucks and drivers assist S4 in hauling supplies, as required.

b. Forward echelon. The forward echelon of headquarters and service company is commanded by the company executive officer. It is located with the battalion forward echelon. Company forward echelon consists of two officers and 44 enlisted men (fig. 67) to include the:

(1) *Company headquarters.* (19) Executive officer, first sergeant, supply sergeant, armorer, 2 orderlies (messengers), 12 filler personnel, a driver and $\frac{3}{4}$ -ton truck.

(2) *Assault platoon.* (27) Entire platoon with its equipment and vehicles. This platoon is held as battalion mobile reserve unless employed otherwise by the battalion commander.



NOTE: *H & S CO CMDR ALSO CMDR OF BN REAR ECHOLON.

**TEN MEN FROM EQUIP & MAINT PLATOON TO BN COMMUNICATION SECTION

Figure 67. Typical reorganization of headquarters, head quarters and service company.

17. BATTALION HEADQUARTERS. *a. Rear Echelon.* Members of the staff sections not required in the forward echelon become part of the rear echelon. These staff sections of 2 officers, 3 warrant officers, and 60 enlisted men (fig. 68) include:

(1) *S1 section.* (9) Personnel section of one warrant officer and 7 enlisted men plus the battalion mail orderly, and 2½-ton truck.

(2) *S2 section.* (1) One corporal, map distributor.

(3) *S3 section.* (6) One bridge construction supervisor, construction surveyor, draftsman, troop I&E specialist, sign painter, and 2½-ton truck.

(4) *S4 section.* (34) One assistant, S4, supply warrant officer; the battalion, division engineer, and water supply subsections, and 13 truck drivers with their trucks and trailers.

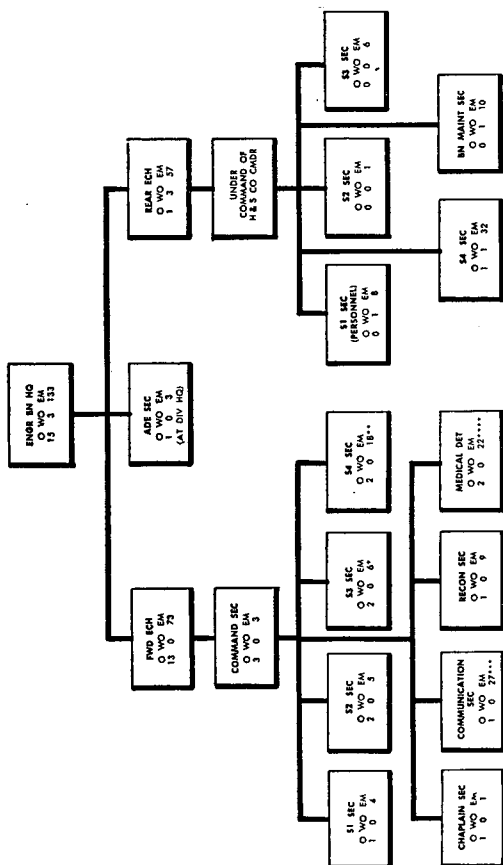
(5) *Battalion maintenance section.* (11) Motor warrant officer, maintenance sergeant, machinist, welder, blacksmith, parts specialist, wrecker operator, 4 chief mechanics, one ¾-ton, one 2½-ton truck, and one heavy wrecker.

(6) *Assistant division engineer section.* (4) Although listed in the T/O&E as a part of battalion headquarters, this section continues its normal function and location at division headquarters.

b. Forward echelon. The battalion headquarters forward echelon (fig. 68) of 13 officers and 73 enlisted men includes:

(1) *Command section.* (6) Battalion commander, executive officer, liaison officer, 3 light-truck drivers with two ¼-ton and one ¾-ton trucks.

(2) *S1 section.* (5) Battalion adjutant, sergeant



NOTE: *ELECTRICIAN TO COMMUNICATION SECTION.
 **INCLUDES AMMO SUPPLY SECTION OF 1 OFF AND 13 EM FROM BN MAINT SECTION.
 ***INCLUDES 10 MEN FROM EQUIP & MAINT PLAT, H & S COMPANY
 ****NOT INCLUDED IN BN TOTAL. AUGMENT FROM REAR ECHESON AS REQUIRED.

Figure 68. Typical reorganization of battalion headquarters sections.

major, stenographer, clerk-typist, and truck driver with $\frac{1}{4}$ -ton truck.

(3) *S2 section.* (7) Entire section with its transportation less the enlisted map distributor.

(4) *S3 section.* (8) Operations officer, assistant operations officer, operations sergeant, two combat construction specialists, demolition man, clerk-typist, and two light-truck drivers with two $\frac{1}{4}$ -ton trucks.

(5) *S4 section.* (20) Supply officer, supply sergeant, two supply clerks, and two light-truck drivers with a $\frac{1}{4}$ -ton and a $\frac{3}{4}$ -ton truck. The section is augmented by a 14-man ammunition supply section from the battalion maintenance section composed of the battalion motor officer, equipment maintenance sergeant, engineer equipment mechanic, metal body repairman, welder, 3 wheeled-vehicle mechanics, 4 mechanic helpers, a metal body painter, and a light-truck driver with a $\frac{1}{4}$ -ton and one $2\frac{1}{2}$ -ton truck. Additional trucks for ammunition supply are obtained from the rear echelon as required.

(6) *Communication section.* (28) The entire section with organic vehicles and augmented by the electrician from the S3 section and 10 selected men from the Hq and Svc Co, equipment and maintenance platoon for use as linemen and messengers.

(7) *Reconnaissance section.* (10) Entire section with organic transportation.

(8) *Chaplain section.* (2) Entire section with organic transportation.

(9) *Medical detachment.* (24) Entire section with organic transportation. Three aid men per rifle company (both forward and rear echelon). Men to serve as litter bearers are taken from the rear echelon as required.

18. REFERENCES. For duties of personnel, and employment and tactics of infantry units see FM's 7-10, 7-20, and 7-40.

19. SUMMARY. The disposition of all personnel and vehicles in the reorganized battalion is summarized in figure 69 and table X.

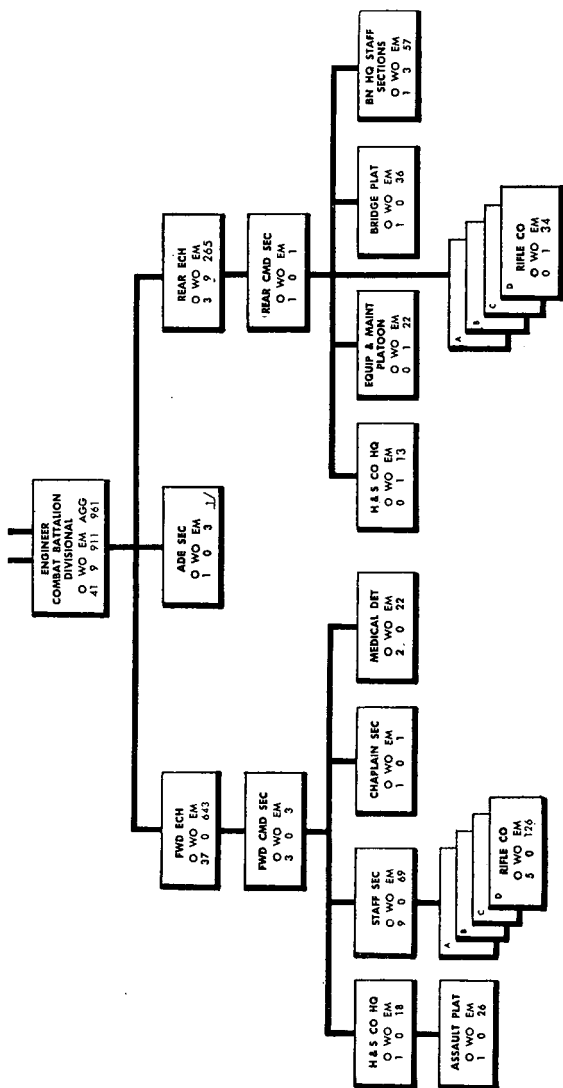
Section VI. ALTERNATE METHOD FOR REORGANIZATION

20. THREE ECHELON REORGANIZATION. The preceding is a guide for a typical reorganization for combat as infantry. It may prove desirable however, to reorganize the battalion with a forward echelon, a service echelon, and a rear echelon. In general, this type of reorganization is similar to that already discussed, except for the service echelon which is taken from the rear echelon and located in the nearest covered area within two or three miles in rear of the battalion command post. A service echelon, under command of the headquarters and service company commander consists of the mess, supply, and motor maintenance personnel of all the companies, and a part of the S4 section. Adequate trucks are retained in this area to provide the transportation to move the forward and service echelon personnel. The rear echelon may be located many miles behind the service echelon. The rear echelon is under command of the S4 and consists of part of the S4 section, the battalion maintenance section, part of the mess section from headquarters and service company, and all personnel not needed in the forward and service echelons. Heavy equipment, and trucks from all companies loaded with individual

Table X. Typical Disposition of Vehicles, Engineer Combat Battalion, Divisional

Unit	Truck, ¼-ton		Truck, ¾-ton (W C & G W C)		Truck, 2½-ton (cargo and dump)		Truck, 2½-ton w/bolster		Truck, 6-ton, treadway		Truck, 6-ton, tractor		Truck, heavy wrecker		Trailer, ¼-ton, cargo		Trailer, 1-ton, cargo		Trailer, water, 250 gal.		Trailer, 2½-ton pole type		Trailer, 2½-ton pole type w/bolster		Trailer, 2½-ton pole type		Trailer, 20-ton		Enter heavy equipment		Remarks	F-Forward R-Rear Ech- selon	
	F	R	F	R	F	R	F	R	F	R	F	R	F	R	F	R	F	R	F	R	F	R	F	R	F	R	F	R	F	R			
Engr Combat Companies:																																	
Squad (36)	12				36																												
Platoon (12)	4				12																												
Co Hq (4)			8	4	8						4					12					4							4					
Subtotal	16	0	8	4	0	56	0	0	0	0	0	4	0	0	16	0	0	16	0	4	0	36	0	0	0	0	4						
Hq & Sv Company:																																	
Co Hq	1	1														1																	
Supply Section						1											1																
Mess Section						1												1															
E & M Platoon	1	1	1	1	1	1						2				1	1																
Bridge Platoon	1	1	1	1	3	2	18									1	1					3	2				2						

Assault Platoon.....	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		</
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NOTE: 1/REMAINS AT DIVISION HEADQUARTERS

Figure 69. Typical reorganization of the engineer combat battalion, divisional.

equipment and organizational property not needed in the forward and service echelons are also retained in the rear echelon.

21. **ENGINEER COMBAT PLATOON.** It may be more desirable to reorganize the engineer combat platoon in the quicker, more simplified method illustrated in figure 70.

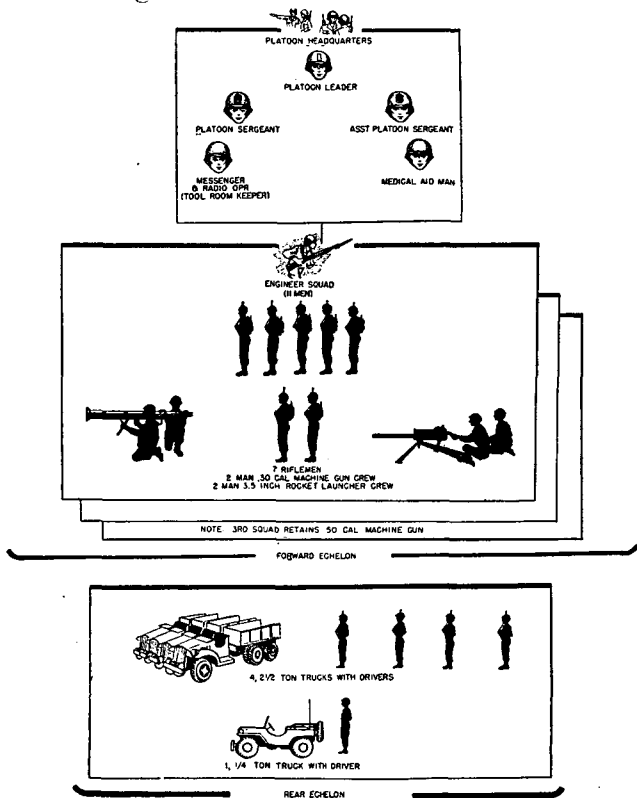


Figure 70. An alternate method of reorganizing the engineer combat platoon.

APPENDIX IV

A GUIDE FOR DUAL-ROLE PROBLEMS

1. The division engineer is at the same time a battalion commander and a division staff officer. This duality of role, staff and command, poses a problem for him which is not the lot of the usual commander or staff officer. The problem is essentially one of deciding where to spend his time and how best to divide his time between his separate duties of command and staff.

2. A method of operation which will solve this problem under all conditions cannot be stated in advance. The ability and personality of individuals and the current tactical situation may require that the method vary between divisions, and from time to time, within a division. Each division engineer must develop the best method as a result of his own experience.

3. Until experience or the division commander's policies indicate otherwise, a general guide for the division engineer is as follows:

a. The division engineer considers his staff and command responsibilities as of equal importance.

b. The proper execution of duties at division and battalion headquarters is dependent on the performance of his reconnaissance, inspections, and visits.

c. The division engineer should perform his duties at division and battalion headquarters in a manner

that will permit him to maximum amount of time for visits, inspections, and reconnaissance.

d. A location for the division engineer's personal headquarters, that is proper under all conditions, cannot be prescribed. However, the division engineer should consider that the normal location of his personal headquarters is with his battalion headquarters. When conditions are not normal, he should locate his headquarters where he can best influence the action favorably with engineer means.

4. The following factors may restrict the division engineer in his efforts to follow the general guide outlined above:

a. Incomplete understanding and personality clashes between the division engineer and staff and with the division commander and staff.

b. Unfamiliarity of the division commander, division staff officers, and regimental commanders with the capabilities and limitations of engineer troops.

c. A fast-moving tactical situation.

d. Intensive planning activity at division headquarters.

e. The attachment of engineer units to combat teams.

f. Poor communications in the battalion or between division and battalion headquarters.

g. The attachment of corps engineer troops to the division.

5. To diminish the above factors and his dual-role problems the division engineer should:

a. Always strive to improve his own efficiency, the efficiency of his staff, and that of the engineer company commanders.

b. Establish and maintain good relations with the division commander, division staff officers, and regimental commanders.

c. Insure that the division commander, his staff, and regimental commanders are familiar with the problems, capabilities, and limitations of engineer troops.

d. Select an assistant division engineer with such ability and personality that he will secure the division staff's confidence.

e. Delegate routine duties to the assistant division engineer and the battalion staff.

f. Demonstrate that engineer troops are normally most effective when in support of combat elements.

g. Insure that the best possible communications are maintained within the battalion and between division and battalion headquarters.

h. Maintain the battalion headquarters as near as possible to the division headquarters.

i. Establish procedures that will result in the continuous exchange of information between himself, the battalion executive officer, and the assistant division engineer.

j. Insure that the assistant division engineer and the executive officer are always able to contact him.

k. Avoid the attachment of corps engineer troops to the division when a support assignment will serve equally well.

INDEX

	<i>Paragraphs</i>	<i>Page</i>
Adjutant.....	127	118
Administrative:		
Echelon, company:		
Company clerk.....	54, 114	52, 108
Equipment and maintenance section.....	57	56
Mess section.....	55, 115	52, 108
Organization.....	52, 112	50, 107
Supply section.....	56, 116	54, 109
Unit administrator.....	53, 113	50, 108
Movement:		
Battalion.....	178	177
Combat teams.....	176	175
Division.....	180	180
Engineer assistance to other arms.....	172	172
Engineer work at destination.....	175	175
Engineer work on roads.....	174	174
Traffic circulation.....	177	175
Section, battalion:		
Duties of personnel.....	127	118
Organization.....	126	121
training.....	128	121
Supervisor, personnel.....	127e	121
Advance and attack:		
Assault platoon.....	79	80
Battalion:		
Control of engineer effort.....	185	186
Engineer missions.....	184	184
Engineer reconnaissance.....	187	189
Engineer work done by other arms.....	188	190
Engineers with the advance guard.....	189	191
Flank security.....	191	194
General.....	182	182

	<i>Paragraphs</i>	<i>Page</i>
Administrative—Continued		
Battalion—Continued		
Initial duties	190	193
Measures to stop enemy advance ..	192	104
Phases of attack	183	184
Typical engineer duties	186	187
Use of smoke	193	194
Combat company	60	61
Platoon	39	35
Squad	21	23
Advance guard, engineers with	189	191
Advanced individual training	165	166
After-burst operations, radiological defense	208	214
Airborne troops, use in river crossings ..	233	231
Air compressor, operators	57 <i>b</i> (6)	67
Air movement	178 <i>d</i>	178
Armorer	56 <i>b</i> (3), 116 <i>a</i>	55, 109
Assault boat	241	240
Assault of fortified positions	83	83
Assault platoon:		
Advance and attack	79	80
Defense	80	82
Duties of personnel	75	76
Employment	76	79
Infantry combat	85	84
Mission	73	76
Organization	74	76
Pioneering	77	79
Retrograde movements	81	82
River-crossing operations	82	82
Security	84	83
Training	78	80
Assembly areas, river crossing	251 <i>a</i>	262
Assignment, battalion	7	7
Attack:		
Phases of	183	184
Positions, river crossing	251 <i>b</i>	262
Basic training:		
Individual military	166	165

	<i>Paragraphs</i>	<i>Page</i>
Basic training—Continued		
Individual engineer.....	167	166
Unit training.....	169	167
Battalion, engineer combat, divisional:		
Assignment.....	7	7
Capabilities.....	6c, 8	7, 12
Comparison with other engineer combat battalions.....	6	6
Composition.....	4	3
Equipment.....	5	3
Mission.....	3	1
Battalion headquarters and staff:		
Adjutant (S1).....	127a	118
Assistant division engineer.....	124a	117
Commander.....	122a	114
Communication officer.....	141	141
Chaplain.....	122f	116
Employment.....	158	159
Executive officer.....	122b	115
Intelligence officer (S2).....	130a	122
Intelligence officer, assistant (S2).....	130b	125
Liaison officer.....	122c	116
Medical officer.....	155	156
Mission.....	119	112
Motor officer.....	149	151
Operations officer (S3).....	133a	128
Operations officer, assistant (S3).....	133b	130
Organization.....	120	112
Reorganization for combat.....	App. III	335
Supply officer (S4).....	136b	133
Before-burst operations, radiological defense.....	207	214
Blacksmith.....	149h	153
Boat groups, river-crossing.....	252	263
Boats:		
Assault, specifications.....	241	240
Assault, handling of.....	253b	267
Reconnaissance.....	242	241
Storm.....	243	245
Utility.....	93	90

	<i>Paragraphs</i>	<i>Page</i>
Body repairman.....	149 <i>h</i>	153
Bridge:		
Airborne, 50-ton.....	249	255
Construction supervisor.....	133 <i>d</i>	130
Crossing on.....	159	280
Division equipment.....	250	255
Floating, M4.....	248	255
Floating, treadway, widened.....	247	250
Foot.....	244, 257	245, 278
Helper.....	98	92
Platoon:		
Employment.....	99	93
Mission.....	86	84
Operations.....	91, 94, 95 <i>a</i>	87, 90, 92
Organization.....	87	84
Training.....	101	94
Platoon headquarters:		
Duties of personnel.....	98	92
Mission.....	96	92
Organization.....	97	92
Specialist.....	89 <i>c</i>	86
Bugler.....	111 <i>e</i>	107
Cableways.....	246	250
Cadre training.....	165	165
Camouflage inspector.....	130 <i>e</i>	126
Cannoneer.....	75 <i>e</i>	78
Capabilities, engineer combat battalion.....	8	12
Chaplain:		
Duties.....	153	155
Organization.....	152	155
Clerk, company.....	54, 114	52, 108
Combat:		
As infantry, reorganization.....	App. III	335
Construction foreman.....	124 <i>b</i>	117
Construction specialists.....	16, 133 <i>e</i> (1)	18, 131
Engineer intelligence sergeant.....	130 <i>c</i>	125
Engineer operations sergeant.....	133 <i>c</i>	130

Command echelon:

Engineer combat company:

Command section.....	50	46
Communication section.....	51	49
Organization.....	49	44

Headquarters and service company:

Duties of personnel.....	111	104
Organization.....	110	104

Command section, battalion:

Duties of personnel.....	122	114
--------------------------	-----	-----

Organization.....	121	113
-------------------	-----	-----

Commander:

Battalion.....	122a	114
Company.....	50a(1), 111a	46, 104

Communication:

Chief.....	141	141
Officer.....	141	141

Section, battalion:

Duties of personnel.....	141	141
Operations.....	142	143
Organization.....	140	141
Training.....	143	143

Section, combat company.....	51	49
------------------------------	----	----

Company:

Clerk.....	54, 114	52, 108
Commander.....	50a(1), 111a	46, 104
Employment.....	58	58
Executive officer.....	50a(2), 111b	47, 106

Headquarters:

Mission.....	47, 108	44, 104
Organization.....	48, 109	44, 104
Operations.....	60	61
Reorganization for combat.....	App. III	335

Combined training.....	170c	169
------------------------	------	-----

Concurrent training.....	171	170
--------------------------	-----	-----

Construction by:

Combat company.....	59a	59
Platoon.....	38a	33
Squad.....	20a	21

	<i>Paragraphs</i>	<i>Page</i>
Construction-machinery foreman.....	104e	98
Convoy:		
Operations, unescorted.....	215	218
Security detachments, engineers with.....	214	218
Cooks.....	57b	56
Cooks helper.....	55b	53
Corps engineer, river crossings.....	237	239
Covering forces:		
In defense.....	200	202
In river crossings.....	251d	263
Defense:		
Against guerilla forces:		
Engineers with convoy security detachments.....	214	218
General.....	210	216
Supply economy.....	212	217
Troop security.....	211	216
Unescorted convoy operations.....	215	218
Unit security.....	213	217
Battalion operations:		
Division rear area defensive positions.....	202	210
Engineer role in the defense.....	198	198
Engineer supply.....	199	200
Flank security.....	203	210
Operations with covering forces.....	200	202
Organization of the battle position and the general outpost.....	201	202
Company, engineer combat.....	61	64
Platoon:		
Assault.....	80	82
Combat.....	40	36
Squad.....	22	23
Defensive positions, division rear area.....	202	210
Delaying action, retrograde movement.....	222	225
Deliberate river crossings.....	229b	230
Demolition specialist.....	75g, 133e(3)	78, 131

	<i>Paragraphs</i>	<i>Page</i>
Denial operations:		
Battalion participation.....	224	226
Destruction.....	227	228
General.....	223	225
Items denied the enemy.....	225	227
Removal.....	226	227
Desert operations.....	270	312
Destruction by:		
Company.....	59 <i>b</i>	61
Platoon.....	38 <i>b</i>	35
Squad.....	20 <i>b</i>	21
Division engineer.....	238	239
Assistant.....	124 <i>a</i>	117
Section:		
Duties of personnel.....	124	117
Operations.....	125	118
Organization.....	123	117
Supply sergeant.....	136 <i>b</i>	133
Supply subsection.....	137	136
Division motor movement.....	180	180
Dozer operators.....	57 <i>b</i> (5)	57
Draftsman.....	124 <i>b</i> , 130 <i>f</i> , 133 <i>f</i>	117, 127, 131
Duties:		
Battalion headquarters:		
Administrative section.....	127	118
Command section.....	122	114
Communication section.....	141	141
Division engineer section.....	124 <i>a</i>	117
Intelligence section.....	130	122
Maintenance section.....	149	151
Medical detachment.....	154	156
Operations section.....	133	128
Reconnaissance section.....	144	145
Supply section:		
Administrative subsection....	136	133
Battalion supply subsection..	138	136
Division engineer supply sub- section.....	137	136
Water supply subsection....	139	137

	<i>Paragraphs</i>	<i>Page</i>
Duties—Continued		
Combat company:		
Administrative echelon.....	53-57	50
Combat construction specialists..	16	18
Command section.....	50	46
Communication section.....	51	49
Platoon leader.....	32	29
Platoon sergeant.....	33	30
Assistant.....	34	31
Pioneers.....	17	19
Squad leader.....	14	17
Assistant.....	15	17
Toolroom keeper.....	35	32
Truck drivers.....	18, 36	19, 32
Effort, control of engineer.....	185	186
Engineers in:		
Advance and attack.....	186, 190	187, 193
Defense.....	198	198
Pursuit.....	197	198
Retrograde movement.....	219	223
Headquarters and service company:		
Administrative echelon.....	112, 113	107, 108
Assault platoon.....	75	76
Bridge platoon headquarters.....	98	92
Command echelon.....	111	104
Equipment and maintenance platoon.....	104	95
Fixed bridge section.....	89	86
Float bridge section.....	93	90
Mess section.....	115	108
Supply section.....	116	109
Echelons:		
Forward.....	264, app. III	298, 335
Rear.....	264, app. III	298, 335
Electrician.....	57b(3), 133e(2)	56, 131
Employment:		
Engineer combat battalion.....	158	159
Company.....	58	58
Platoon.....	37	32
Squad.....	19	20

	<i>Paragraphs</i>	<i>Page</i>
Engineers in—Continued		
Employment—Continued		
Headquarters and service com- pany:		
Assault platoon.....	76	79
Bridge platoon.....	90, 99	87, 93
Equipment and maintenance Platoon.....	105 76	98 79
Engineer:		
Effort, control of.....	185	186
Equipment maintenance supervisor....	149 <i>d</i>	152
Supply specialists.....	56 <i>b</i> (2)	54
Work done by other arms.....	188	190
Equipment:		
Engineer combat battalion.....	5	3
Engineer combat company.....	11	14
Equipment and maintenance platoon:		
Duties of personnel.....	104	95
Employment.....	105	98
Mission.....	102	95
Operations.....	106	99
Organization.....	103	95
Training.....	107	103
Equipment and maintenance section, en- gineer combat company.....	57	56
Equipment:		
Operators.....	104	95
Pool.....	72, 106	75, 99
Essential training phases.....	164	165
Executive officer:		
Battalion.....	122 <i>b</i>	115
Combat company.....	50 <i>a</i> (2)	47
Headquarters and service company....	111 <i>b</i>	106
Fillers.....	50 <i>a</i> (5) 111 <i>g</i>	49, 107
First sereant.....	50 <i>a</i> (3), 111 <i>c</i>	48, 107
Fixed sections, bridge platoon:		
Duties of personnel.....	89	86
Employment.....	90	87
Operations.....	91	87
Organization.....	88	86

	<i>Paragraphs</i>	<i>Page</i>
Flank security in:		
Advance and attack.....	91	194
Defense.....	203	210
Float section, bridge platoon:		
Duties of personnel.....	93	90
Employment.....	94	90
Operation.....	95	92
Organization.....	92	90
Footbridges.....	244, 257	245, 278
Fortified positions, assault of.....	83, 266	83, 300
Forward echelon.....	263b(1), app. III	296, 335
General outpost.....	201	202
Group, engineer combat, in support.....	234a, 239	232, 239
Guerilla force, defense against.....	198b, 214	198, 218
Guide for dual-role problems.....	App. IV	339
Hasty defense, engineer supply for.....	199b	200
Hasty, river-crossing.....	229a	229
Headquarters, combat company.....	47	44
Headquarters and service company:		
Company headquarters.....	108	104
Equipment pool.....	72	75
Headquarters function.....	70	75
Mission.....	68	73
Operations.....	117	110
Organization.....	69	73
Service function.....	71	75
Training.....	118	111
Individual advanced training.....	167	166
Individual basic training.....	166	165
Individual training squad.....	27	27
Infantry combat:		
Assault platoon.....	App. III	335
Battalion:		
General.....	262	294
General organization for.....	263, app. III	296, 335
Support, fire power, and com- munication.....	264	298

	<i>Paragraphs</i>	<i>Page</i>
Infantry combat—Continued		
Company	65	69
Platoon	44	41
Re-organization for	App. III	335
Squad	26	26
Infantry support raft	245	246
Intelligence officer	130a	122
Assistant	130b	125
Intelligence section, battalion headquarters:		
Duties of personnel	130	122
Organization	129	122
Training	131	127
Jungle operations	269	307
Liaison:		
Officer	122c	116
In attack and defense	185c	186
In river crossings	240	240
Machinist	149f	152
Mail clerk, battalion headquarters	127g	121
Maintenance, headquarters and service company	106b	102
Maintenance section battalion:		
Duties of personnel	149	151
Operations	150	153
Organization	148	150
Training	151	154
Management of training	163	162
Map distributor	130d	125
March, motor	178b	178
Mechanics	57b(2), 104e, 149g	56, 98, 152
Medical assistant	155b	156
Medical detachment:		
Duties of personnel	155	156
Operations	156	157
Organization	154	156
Training	157	158

	<i>Paragraphs</i>	<i>Page</i>
Medical officer.....	155a	156
Medical detachment sergeant.....	178c	178
Message center clerks.....	141c	142
Mess section.....	55, 115	52, 108
Mess steward.....	55b(1)	53
Mission:		
Battalion headquarters.....	119	112
Engineer combat battalion.....	3	1
Engineer combat company.....	9	14
Company headquarters.....	47	44
Platoon.....	30	28
Squad.....	12	16
Headquarters and service company...	68	73
Assault platoon.....	73	76
Bridge platoon.....	86	84
Bridge platoon headquarters.....	96	92
Company headquarters.....	108	104
Equipment and maintenance platoon...	102	95
Mission, engineer, in attack.....	184	184
Motor march.....	178b	178
Motor movement, division.....	180	180
Motor maintenance sergeant.....	104b, 173	97, 173
Motor officer, battalion.....	149a	151
Mountain operations.....	267	303
Movement, administrative:		
Battalion.....	178	177
Combat teams.....	176	175
Operation:		
Battalion headquarters:		
Communications section.....	142	143
Division engineer section.....	125	118
Maintenance section.....	150	153
Medical detachment.....	156	157
Reconnaissance section.....	146	146
Water supply section.....	139c	137
Headquarters and service company...	117	110
Bridge platoon:		
Fixed sections.....	91	87
Floating section.....	95	92

	<i>Paragraphs</i>	<i>Page</i>
Operation—Continued		
Headquarters and service company—Con.		
Equipment and maintenance		
platoon.....	106	99
Operations officer, battalion S3.....	133a	128
Operations officer, assistant.....	133b	130
Operations section:		
Duties of personnel.....	133	128
Organization.....	132	128
Training.....	134	132
Operations with covering forces.....	200	202
Operators:		
Air compressor.....	57b(6)	57
Dozers.....	57b(5)	57
Equipment.....	104f	98
Powerboat.....	93	90
Radio.....	98c, 111d, 122d	93, 107, 116
Switchboard.....	141d	142
Tank dozer.....	75f	78
Wrecker.....	149j	153
Orderly.....	111f	107
Organization:		
Battalion headquarters:		
Administrative section.....	126	118
Battalion headquarters.....	120	112
Command section.....	121	113
Communications section.....	140	141
Division engineer section.....	123	117
Intelligence section.....	129	122
Maintenance section.....	148	150
Medical detachment.....	154	156
Operations section.....	132	128
Reconnaissance section.....	144	145
Supply section:		
Administrative subsection....	136a	133
Battalion supply subsection..	138a	136
Division engineer supply sub-		
section.....	137a	136
Water supply subsection....	139a	137

	<i>Paragraphs</i>	<i>Page</i>
Organization—Continued		
Engineer combat battalion	4	3
Engineer combat company	10	14
Administrative echelon	52	50
Command echelon	49	44
Command section	50 <i>b</i>	49
Communication section	51 <i>b</i>	50
Company headquarters	48	44
Equipment and maintenance section	57 <i>a</i>	56
Mess section	55 <i>c</i>	53
Platoon	31	29
Squad	13	16
Supply section	56 <i>a</i>	54
Headquarters and service company	69	73
Administrative echelon	112	107
Assault platoon	74	76
Bridge platoon	87	84
Fixed section	88	86
Float section	92	90
Headquarters	97	92
Command echelon	110	104
Command headquarters	109	104
Equipment and maintenance platoon	103	95
Mess section	115 <i>a</i>	108
Supply section	116 <i>a</i>	109
Organization of:		
Battle position, the	201	202
Radiological defense	206	212
River crossings	252	263
Painter	149 <i>h</i>	153
Parts specialist	149 <i>e</i>	152
Personnel:		
Administrative supervisor	127 <i>e</i>	121
Management specialist	127 <i>e</i>	121
Management assistant	127 <i>e</i>	121
Sergeant	127 <i>d</i>	120
Warrant officer	127 <i>b</i>	120

	<i>Paragraphs</i>	<i>Page</i>
Phases of unit training.....	170	169
Photographer.....	130g	127
Pioneering:		
Assault platoon.....	77	79
Engineer combat company.....	59	59
Platoon.....	38	33
Squad.....	20	21
Pioneers.....	17	19
Platoon, combat company:		
Duties of headquarters personnel:		
Platoon leader.....	32	29
Platoon sergeant.....	33	30
Platoon sergeant, assistant.....	34	31
Toolroom keeper.....	35	32
Truck drivers.....	18, 36	19, 32
Employment.....	37	32
Mission.....	30	28
Organization.....	31	29
Pioneering.....	38	33
Training:		
General.....	45	43
Other arms and services.....	46	43
Platoon combat operations:		
Advance and attack.....	39	35
Combat as infantry.....	44	41
Defense.....	40	36
Retrograde movements.....	41	37
River-crossing operations.....	42	39
Security.....	43	41
Platoon:		
Leader.....	32, 104a	29, 95
Employment.....	37	32
Sergeant.....	33, 75b, 98b	30, 78, 93
Powerboat operator.....	93	90
Preparatory movements.....	251	262
Pursuit, battalion operations:		
Composition.....	195	196
Duties of engineers.....	197	198

	<i>Paragraphs</i>	<i>Page</i>
Pursuit, battalion operations—Continued		
Employment of engineers-----	196	196
General-----	194	196
Radiological defense:		
After-burst operations-----	208	214
Before-burst operations-----	207	214
Command responsibilities-----	205	212
General-----	204	211
Organization structure-----	206	212
Training-----	209	215
Radio mechanic-----	141 <i>f</i>	143
Radio operator-----	98, 111 <i>d</i>	92, 107
Rafts:	122 <i>d</i> , 141 <i>d</i>	116, 142
Crossing on-----	258	278
Infantry support-----	245	246
Rail movements-----	178	177
Rear echelon-----	263, app. III	296, 335
Reconnaissance:		
Boat-----	242	241
Engineer combat company:		
Company-----	59 <i>c</i>	61
Platoon-----	38	33
Squad-----	20	21
Engineer in the advance and attack--	187	189
Officer-----	145	145
River-crossing-----	234	232
Section, battalion headquarters:		
Duties of personnel-----	145	145
Operations-----	146	146
Organization-----	144	145
Training-----	147	150
Replacement training-----	168	167
Responsibility for training-----	162	161
Retirement, retrograde movement-----	221	224
Retrograde movements:		
Battalion operations:		
Delaying action-----	222	225
Engineer duties-----	219	223
Engineer support of other arms--	218	220

	<i>Paragraphs</i>	<i>Page</i>
Retrograde movements—Continued		
Battalion operations—Continued		
General.....	217	220
Retirement.....	221	224
Withdrawal.....	220	224
Company operations:		
Assault platoon.....	81	82
Company.....	62	64
Platoon.....	41	37
Squad.....	23	23
River-crossing:		
Battalion operations:		
Airborne troops, use of.....	233	231
Basic steps.....	230	230
Combat group commander.....	239	239
Corps engineer.....	237	239
Crossing means.....	232	231
Division engineer.....	238	239
Engineer plan:		
General.....	260	280
Illustrative situation.....	261	284
Far-shore objectives.....	231	230
General.....	228	228
Liaison.....	240	240
Planning and reconnaissance.....	234	232
Tactical formation.....	235	236
Troops and materials.....	236	238
Types of crossings.....	229	229
Engineer combat company:		
Company.....	63	67
Platoon.....	42	39
Squad.....	24	26
Headquarters and service company:		
Assault platoon.....	82	82
Bridge platoon:		
Fixed sections.....	91	87
Float section.....	95	92

	<i>Paragraphs</i>	<i>Page</i>
River-crossing—Continued		
Standard equipage:		
Boats:		
Assault, M2.....	241	240
Reconnaissance.....	242	241
Storm.....	243	245
Bridges:		
Airborne, 50-ton.....	249	255
Foating, M4.....	248	255
Floating, treadway, widened.....	247	250
Foot.....	244	245
Cableways.....	246	250
Division bridge equipment.....	250	255
Footbridge.....	244	245
Infantry support raft.....	245	246
Security:		
Against guerilla attack.....	211, 213	216, 217
Assault platoon.....	84	83
Battalion.....	160	160
Company.....	64	67
Flank.....	191, 203	194, 210
Platoon.....	43	41
Squad.....	25	26
Senior supply clerk.....	136b(3)	135
Sergeant:		
Combat engineer intelligence.....	130c	125
Combat engineer operations.....	133c	130
Combat construction.....	34	31
First.....	50a(3), 111c	48, 107
Major.....	127c	120
Motor.....	104b	97
Medical.....	155c	156
Platoon.....	33	30
Personnel.....	127d	120
Section, fixed and floating.....	89a, b, 93	86, 90
Supply—general, engineer and water.....	56, 137b, 138b, 139a	54, 136, 137
Service function, headquarters and service company.....	71	75

	<i>Paragraphs</i>	<i>Page</i>
Sign painter	133f	131
Smoke, use of	193	194
Snow operations	268	307
SOP, recommended outline for	App. II	323
Specialist training	169c	168
Squad:		
Combat company:		
Duties of personnel	14-18	17
Employment	19	20
Mission	12	16
Organization	13	16
Pioneering	20	21
Training	27-29	27
Combat operations:		
Advance and attack	21	23
Combat as infantry	26	26
Defense	22	23
Retrograde movement	23	23
River-crossing operations	24	26
Security	25	26
Leader	14	17
Assistant	15	17
Standing operating procedure	157, app. II	159, 323
Stenographer and clerk-typist	127f	121
Storm boat	243	245
Supply:		
Economy	212	217
Engineer, in the defense	197	200
Officer, battalion S4	136b(1)	133
Assistant	136b(2)	135
Section, battalion headquarters	135-139	132
Section, company	56, 116	54, 109
Sergeant	56b(1), 138b	54, 136
Specialist	56b(2), 137b	54, 136
Warrant officer	136b(2)	135
Support of other arms, retrograde move- ment	218	220
Surveyor	133f	131
Switchboard operator	141d	142

	<i>Paragraphs</i>	<i>Page</i>
Tactical movements:		
Battalion participation.....	81	181
Division motor movement.....	180	180
General.....	179	179
Tank dozer:		
Cannoneer.....	75e	78
Commander.....	75c	78
Demolition specialist.....	75g	78
Employment.....	76	79
Gunner.....	75d	78
Operations.....	77	79
Operator.....	75f	78
Toolroom keeper.....	35	32
Traffic circulation.....	177	175
Training:		
Battalion headquarters:		
Administrative section.....	128	121
Communication section.....	143	143
Intelligence section.....	131	127
Maintenance section.....	151	154
Medical detachment.....	157	158
Operations section.....	134	132
Reconnaissance section.....	147	150
Water supply subsection.....	139d	140
Battalion operations:		
Advanced individual.....	167	166
Basic individual.....	166	165
Cadre.....	165	165
Concurrent.....	171	170
Essential training phases.....	164	165
General.....	161	160
Management.....	163	162
Phases of unit training.....	170	169
Replacement.....	168	167
Responsibility.....	162	161
Specialists.....	169c	168
Unit training.....	169	167
Combat company:		
Communication section.....	51c	50

	<i>Paragraphs</i>	<i>Page</i>
Training—Continued		
Combat company—Continued		
Equipment and maintenance section.....	57 <i>d</i>	57
General.....	66	71
Mess section.....	55 <i>d</i>	53
Other arms and services.....	67	72
Platoon:		
General.....	45	43
Other arms and services.....	46	43
Squad:		
Individual.....	27	27
Other arms and services.....	29	28
Unit.....	28	27
Supply section.....	56 <i>d</i>	55
Headquarters and service company:		
Assault platoon.....	78	80
Bridge platoon.....	101	94
Company.....	118	111
Equipment and maintenance platoon.....	107	103
Mess section.....	115 <i>c</i>	109
Radiological defense.....	209	215
Troop information and education corporal.....	133 <i>g</i>	132
Truck driver, general.....	18, 36	19, 32
Typist.....	133 <i>f</i>	131
Unit administrator.....	53, 113	50, 108
Unit training.....	169	167
Warrant officer:		
Battalion maintenance.....	149 <i>b</i>	151
Equipment and maintenance, H & S Co.....	104	95
Personnel.....	127 <i>b</i>	120
Supply.....	136 <i>b</i> (2)	135
Unit administrator.....	53, 113	50, 108
Water movement.....	178 <i>e</i>	179
Water supply:		
Sergeant.....	139 <i>b</i>	137

	<i>Paragraphs</i>	<i>Page</i>
Water supply—Continued		
Specialist-----	139 <i>b</i>	137
Subsection-----	139	137
Welder-----	149 <i>i</i>	153
Wiremen-----	141 <i>e</i>	143
Withdrawal-----	220	224
Wrecker operator-----	149 <i>j</i>	153

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